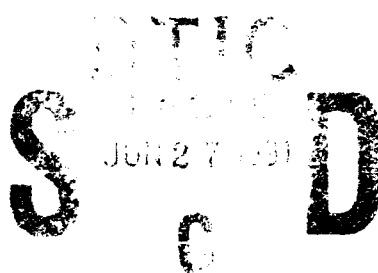


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Ada 9X Project Report

Ada 9X Requirements Rationale

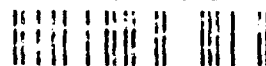
May 1991

Office of the Under Secretary of Defense for Acquisition

Washington, D.C. 20301

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Ada 9X Project Report

Ada 9X Requirements Rationale

May 1991

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May 1991

Ada 9X Requirements Rationale



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1 Introduction

The Ada 9X Revision process (described in [2]) included the solicitation of *Revision Requests* (RRs) from the world-wide Ada community. Well over 700 RRs were submitted in response to this solicitation, and these RRs formed an important input in determining the requirements to be met by the Mapping/Revision Team. In addition, suggestions for improvement have been gathered over the years in comments submitted in accordance with the directions in the Postscript to the standard [4]. These comments have been grouped into draft Ada commentaries (AIs) in the *study* class. Both the revision requests and commentaries in the study class served as inputs to the Requirements Team.

This document serves several purposes:

- It shows how each RR and study AI is related to the requirements given in the *Ada 9X Requirements* document [9]. The association is given in three ways: in order by requirement number, in order by RR and AI number, and in order by keywords appearing in the title of an AI or RR.
- This document also discusses some alternatives that were considered during the requirements definition phase and in some cases amplifies the discussion presented in the requirements document itself. In developing these comments on the requirements, we have been helped by comments on the requirements document that were submitted by members of the canvass group established for voting on the proposed revision to the standard.

It should not be surprising that it was judged infeasible to meet all requests submitted. Indeed, doing so was impossible when RRs made contradictory requests. Consider, for example, RR-0098, "Generalize incomplete typing for types other than access or private" and RR-0259, "Incomplete type declarations are dangerous and unnecessary".

Some RRs contained multiple requests; for these, each request is listed separately with a letter after the RR number as if the RR were in fact multiple RRs. After eliminating duplicates (6 RRs and 14 AIs), there were 822 RRs and 60 AIs to be considered of which 214 (25%) were rejected. The rest were addressed at least in part by some requirement.

This document is intended to be read in parallel with the Requirements Document. Chapters 2 through 11 of this document correspond to the same-numbered chapters of the Requirements Document; Chapter 12 corresponds to Appendix A of the Requirements Document. Each of these chapters contains the same section titles as the corresponding chapter of the Requirements Document and lists (by title only) the User Needs, Requirements, and Study Topics. Included for each Requirement and Study Topic is a list of all RRs and AIs whose request is met, at least in part, by that item.

Chapter 13 lists those RRs and AIs that have been rejected, providing at least a phrase and in some cases a few sentences of explanation for the rejection. When explanations apply equally to several RRs, such RRs are collected into subsections of that chapter so that the explanation need be provided only once.

Finally, Appendix A lists, in numeric order, all Revision Requests submitted; Appendix B similarly lists AIs. For each item a title is given along with a brief explanation of its disposition:

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- For those RRs and AIs whose request was met (at least in part), there is a reference to the Requirements Document that points to the place in that document (a Requirement or a Study Topic) where the topic of the RR or AI is dealt with. Such a reference indicates that the request was met to at least some extent, even if it was not met in its entirety.
- Some requests, usually requests for no change in a specific area, are marked as having been met, with no reference.
- Some requests are marked as rejected, with a brief explanation and a reference to a section of Chapter 13 of this document.

The Requirements Document is referenced either by section number or by citing a specific Requirement or Study Topic. All Requirements and Study Topics are listed in the Table of Contents of [9].

The titles given for RRs and AIs were generated to reflect our understanding of the intent of the request. When an RR covered multiple topics, separate titles were devised for each topic.

Acknowledgments

The initial phase of the requirements process was performed by a team based at the Institute for Defense Analyses (IDA). This team consisted of Cy Ardoin (IDA), Paul Baker (CTA), Douglas Dunlop (Intermetrics), Audrey Hook (IDA), Joseph Linn (IDA), Catherine McDonald (IDA), Reginald Meeson, Jr. (IDA), Steven Michell (Prior Data Sciences: Canada), and Karl Nyberg (Grebyn Corp). The initial team collected the revision requests, classified them, and produced version 1.0 of the requirements in June 1990. This version was not publicly released but consisted of a high-level statement of key requirements distilled from the revision requests, workshops, and various meetings with the Distinguished Reviewers. The IDA version of the requirements was extremely helpful to us in developing Version 3.3 of the requirements (the so-called Working Draft released in September 1990). Without the IDA version as a baseline, it would have been very difficult for us to have produced a satisfactory version by September 1990.

The Working Draft version of the Requirements Document requested comments from the public on a very short time scale. Approximately 1500 comments were received, and just about all of them were constructive and helpful, especially those that suggested revised wording. Anyone comparing the September release with the final release will see many important changes, and many of these changes directly reflect the comments that we received. Although we cannot take the space to list each comment, most commenters will see that their contribution did indeed affect the final version of the requirements. Please accept our thanks and appreciation.

In addition, we particularly wish to thank Norman Cohen for providing many helpful comments on the Working Draft and a draft version of Chapter 9 on requirements for trusted and safety-critical systems.

The Requirements Team consisted of John B. Goodenough (Software Engineering Institute), leader and principal author of the Requirements document and of the Rationale; Arthur Evans, Jr. (Software Engineering Institute), Robert B. K. Dewar (New York University), and Benjamin Brosgol (Alsys, Inc.). We are grateful to Gary Dismukes for providing careful comments on a draft of the Rationale.

2 General Requirements

2.1 Presentation Requirements

User Need U2.1-A: Improve Wording to Reflect the Intended Meaning

Requirement R2.1-A(1) — Incorporate Approved Commentaries

Several revision requests mention problems that are addressed by approved Ada commentaries. Hence, these requests (listed below) are satisfied by the requirement to incorporate approved commentaries into the revised standard.

- RR-0013 Allow task activation to occur at a higher priority than task execution
This request appears to be met by AI-00288, which requires that a task's activation occur at either its activator's priority or at its normal priority, whichever is higher.
- RR-0023 Require TERMINATE alternative to terminate library tasks
This is already addressed by AI-00399.
- RR-0215 Clarify termination of tasks dependent on library packages
This problem is addressed by AI-00399.
- RR-0257 Ensure that BOOLEAN and BYTE arrays can be tightly packed
AI-00555, which has been approved by the Ada Rapporteur Group, specifies that arrays of boolean components must be packed with no gaps. AI-00556 addresses the problem of arrays of bytes, but has not yet been approved.
- RR-0370C Library level tasks can't terminate
AI-00399 explains when such tasks can terminate.
- RR-0496 Clarify termination of tasks whose masters are library units
AI-00399 defines the effect of termination on library-level tasks.
- RR-0571B Clarify the effect when the choice in an aggregate is outside the range of the applicable index constraint
AI-00309 deals with this problem.
- RR-0581B Clarify the effect of applying pragma ELABORATE to a package that has no body
AI-00236 specifies the effect of the pragma in these cases.
- RR-0583 Delete NUMERIC_ERROR if now subsumed under CONSTRAINT_ERROR
AI-00387 recommends that NUMERIC_ERROR be replaced with CONSTRAINT_ERROR.
- RR-0724 Need clearer/simpler overload resolution rules, especially for implicit conversion
The problem mentioned here is addressed by AI-00136 and AI-00606.
- RR-0769 Correct wording in the definition of ancestor unit
See AI-00482.

Requirement R2.1-A(2) — Review Other Presentation Suggestions

The following RRs mention areas for possible improvement in the wording of the standard. These requests do not generally ask for a change in functionality — only clearer wording is requested. When the Mapping/Revision Team begins to revise the wording of the standard, these requests should be given consideration, although not all of these suggestions should necessarily be followed. For example, several of the requests complain that it is too hard to determine the consequences of language rules. In essence, these requests want the Standard to be written in a more tutorial manner. We list these requests here because they indicate areas in which the wording of the Standard might be made clearer. However, we did not specify that the Standard be written in a more tutorial manner because such a presentation style is inappropriate for a Standard. For example, one goal in writing a Standard is to avoid redundant or alternative phrasings

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of rules lest the alternative statements be interpreted differently. While such alternative phrasings may be helpful to readers who are unfamiliar with a language, they are inconsistent with the goal of minimizing possibilities for divergent interpretations of rules. Moreover, being more tutorial would make the Standard longer without making it sufficiently tutorial for many users.

(Note: underlined Revision Requests and AIs contain examples or discussion that may be especially helpful to the Mapping/Revision Team.)

RR-0067 Clarify/define technical terms used

This RR provides some detailed comments that may be useful.

RR-0204 Clarify which fixed point operators are predefined

This RR proposes an improvement to the Standard's Appendix C.

RR-0206 Paragraph numbers should be included in the cross references

RR-0260 The Standard is unclear in various ways

The RR contains several useful suggestions. However, the submitter wants the Standard to be more tutorial, which is probably not possible in a document intended to serve as the specification for a language.

RR-0267 The Standard is confusing in distinguishing specifications and declarations

The submitter wants the Standard to be more tutorial.

RR-0274 The visibility rules could be explained more clearly

The submitter wants the Standard to be more tutorial.

RR-0281 Confusing treatment of term "delay statement"

RR-0292 Section 13.6 of the standard has no semantic content

The RR notes correctly that the section is, in essence, just a note and perhaps should be so titled.

RR-0298 Clarify classes of objects usable as attribute prefixes

The submitter wants the Standard to be more tutorial.

RR-0301 The wording concerning checking for consistency between compilations can be improved

The RR suggests a helpful rewording.

RR-0305 Clarify wording of FOR loop completion

RR-0309 Ensure all cross references are complete and correct

RR-0350 Clarify wording dealing with default initial values

RR-0436 Clarify task synchronization point inconsistencies

This problem should be addressed.

RR-0500 More terms should be hyphenated to improve clarity

RR-0501 The Standard should be consistent in delimiting section headings

RR-0502 The Standard should be consistent in its use of upper and lower cases

RR-0528 Change Ada character names to recognized names for verbal communication

The problem addressed in the RR is the names assigned to characters in Section 2.1(15) and 2.2(10). The RR cites federal law requiring facilities for the handicapped.

RR-0622 The Standard should use "metatype" in describing generic formal types

RR-0757 Clean up definitions of program unit and compilation unit

This clarification may be worthwhile.

RR-0758 Bad paragraph numbering

User Need U2.1-B: Maintain Continuity with the Existing Standard

Requirement R2.1-B(1) — Maintain Format of Existing Standard

During the development of the Ada 9X requirements, there were several intense discussions about whether a formal definition should be provided for the 9X revision. A group at the Destin Workshop [1] recommended strongly that a formal static semantic definition be included in the

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revised standard. It was argued that such a definition would reduce the number of ambiguities that would otherwise be present. The Requirements Team and the Distinguished Reviewers decided however, that the development of a formal static semantic definition should not be required as part of the revision process. There were several reasons. First, if the current standard's specification of legal programs was replaced with a more formal notation, this mere change in presentation would give the appearance of great change to Ada 83 whether or not this was in fact the case. Second, restricting the use of formal notation to just a description of Ada's static semantics would not in practice be of significant help to Ada programmers or implementors even though some people have suggested that the large number of official Commentaries [3] on the language indicates that the current presentation method is inadequate or unsuitable. A careful study of these commentaries shows that most of them deal with minor technical corrections where the intent was clear but the wording was imprecise. A formal definition would not necessarily reduce the need for technical corrections.

Other suggestions for reorganizing the standard or for rewriting it in a different style were made by various sources and were rejected for essentially the same reasons. Although there are a number of Revision Requests that, in essence, complain that the RM is hard to understand, it is far from clear that any alternative style or organization would be both easier to understand and technically precise.

Finally, whether or not one agrees with the above arguments, the Requirements Team felt that the Mapping/Revision Team should concentrate on improving the functionality of the Ada language rather than on revamping the presentation of the standard.

User Need U2.1-C: Derivative Use of the Standard

Requirement R2.1-C(1) — Machine-Readable Version of the Standard

Although ANSI/MIL-STD-1815A is available in ASCII format, it was not distributed with text-formatting codes. This increased costs to those who wished to produce a printed version of the standard while maintaining its typographic style. Two revision requests suggested that a machine-readable version of the revised standard be provided and that this version use a standard formatting (or markup) language. The Standard Generalized Markup Language (SGML) [10] was suggested by both revision requests, but the Requirements Team felt it was best to leave this decision to the Mapping/Revision Team. For example, it might be reasonable to use TEX since this formatting language is widely available and in the public domain.

RR-0318 Make a machine-readable version of the Standard available (with embedded mark-up)

RR-0481 Make Ada documentation available in SGML format

2.2 Efficiency, Simplicity, and Consistency

It was clear from the beginning of the revision effort that the minimal change to the standard would be to at least incorporate wording changes that reflect approved Ada commentaries. This section of the requirements document represents the next level of minimal change, namely, small changes that reflect better insight into rules of the language that incur unexpected penalties in compilation or execution costs, or that have proven to be confusing to users or unnecessarily restrictive. These are the kinds of "clean-up" activities that are a normal part of any language

2: General Requirements

revision effort. The intention in this part of the requirements document was to redress anomalies that could be fixed by small changes to the language.

User Need U2.2-A: Minimize Compilation and Execution Costs

Requirement R2.2-A(1) — Reduce Deterrents to Efficiency

Appendix Section A.1 of the Requirements Document lists some areas in which unlikely interactions between language features incur excessive compilation or execution costs. Revision requests associated with the suggestions in that appendix are discussed in Section 12.1 on page 49.

Only a partial list of potential areas for revision in this area was given in the Requirements Document. Additional RRs that point out potential areas to be considered are listed below. The lengthy discussion in RR-0705 is particularly relevant.

RR-0122 Permit an implementation to reject some integer types as array indexes

RR-0279 If tasks are not used, the run-time system and compiled code should not include code for tasking support

RR-0401 Fixed-base fixed-point operations cannot be done efficiently because of accuracy requirements

RR-592 duplicates the content of this RR.

RR-0574 Inability to eliminate constraint check for OUT parameters

This RR points out a situation in which a redundant constraint check must be performed both inside and outside a procedure.

RR-0693 Parameter passing rules for scalars makes generic code sharing hard

RR-0705 For better performance, remove restrictions on static expressions

The RR provides a detailed analysis of approved AIs in terms of their possible effect on efficiency of both compilation and execution.

RR-0740 For optimization with respect to inlined subprograms, allow merging of scopes

Several revision requests mention a need to increase an implementation's freedom to optimize programs. Other requests state that section 11.6 of the standard already allows too much freedom. Issues concerned with Ada's optimization rules will be the subject of a forthcoming Ada 9X Report. The RRs listed below are those that indicate ways in which section 11.6 may constrain implementations too greatly. RRs complaining that there is too much optimization freedom are cited in association with Requirement R9.1-A(2).

RR-0387 Relax 11.6 optimization rules to allow compiler to do more optimizing

RR-0683 Section 11.6 of the Standard is unclear about what replacements are allowed

RR-0685 Clarify and loosen 11.6 to allow more optimization

RR-0739 Relax 11.6 canonical order rules to allow more optimization

User Need U2.2-B: Ease of Learning

Requirement R2.2-B(1) — Understandability

Appendix Section A.2 of the Requirements Document lists some language rules that have proven to be confusing or error-prone for users of the language and that are therefore candidates for revision. Revision requests associated with the suggestions in that appendix are discussed in Section 12.2 on page 49.

Only a partial list of potential areas for revision was given in the Requirements Document. Additional areas for consideration are listed below.

2: General Requirements

RR-0094 Make the multiple declaration rules more complete and consistent

RR-0275 Error-prone and counter-intuitive aspects of RENAMEs

RR-0344 Need to simplify/relax the conformance rules

RR-0395 Include formal parameter names in parameter/result-type profile

The RR points out that it is illegal to declare two subprograms with the same parameter and result type profile in the same declarative region even if corresponding formal parameter names are different. This illegality seems inconsistent to programmers since such subprograms can be unambiguously called using named parameter associations, and moreover, such overloadings can occur as a result of USE clauses and generic instantiations (see, e.g., 12.3(22)). The Mapping/Revision Team may wish to consider whether this apparent irregularity should be preserved in Ada 9X. The RR points out that allowing such declarations may cause problems with renaming declarations, since if the subprogram being renamed is overloaded in this way, the overloading cannot be disambiguated based on the formal parameter names of the renamed subprogram.

RR-0565 'SMALL is unsuitably defined; need for representation clauses inappropriate

RR-0600 Allow formal parameter names in parameter/result-type profile
See the comment for RR-0395.

RR-0619 Eliminate three replacement characters, stick to normal ASCII

Simplifying the language by removing these alternatives is not upward compatible, but few programs use these replacement characters.

RR-0631 Make conformance rules consistent

RR-0774F Allow aliased exceptions within the same exception handler

It seems that it would be both useful and harmless to allow both P1.END_ERROR and P2.END_ERROR as exception choices in a single exception handler when both exceptions denote IO_EXCEPTIONS.END_ERROR.

Several requests noted the confusion that arises because a fixed point type need not include the values specified in the type's range constraint.

RR-0191 Fixed point model numbers should include the bounds of the type definition

RR-0252D Fixed point type should include the bounds of the range definition

RR-0566 Fixed point model numbers should include the bounds of the type definition

User Need U2.2-C: Generality

Requirement R2.2-C(1) — Minimize Special-Case Restrictions

Appendix Section A.3 of the Requirements Document lists some language restrictions that seem to be surprising to users of the language. For example, the Requirements Document (and one revision request) note that although an accept statement is similar in structure to a procedure body, an exception handler cannot be written after the sequence of statements of an accept body. Revision requests associated with suggestions contained in Appendix Section A.3 of the Requirements Document are listed in Section 12.3 on page 51.

Appendix Section A.4 lists small functional extensions that might make Ada easier to use. Revision requests associated with these extensions are listed in Section 12.4 on page 54.

Only a partial list of potential improvements in generality and usability was given in the Requirements Document. Additional areas to be considered are given below.

RR-0010 Allow the full declaration of a private type with discriminants to be a derived type
See also RR-0423.

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RR-0319 Remove arbitrary language restrictions, improve orthogonality

The RR does not give any specific suggestions, but the general intent of the RR is consistent with the requirement for generality.

RR-0341 Allow discriminant value in record aggregate to be non-static

The RR makes a useful suggestion for removing a restriction.

RR-0381 Records should have composed operations with respect to components

RR-0418 Representation clauses for array types need to be added

RR-0423 Remove discriminant restriction on full declarations of private types

The RR raises some points worthy of consideration. It refers to AI-00037 for a complete discussion of the problem.

RR-0522 Allow non-discrete record discriminants

RR-0567 Allow variable declaration to get constraints from initial value

RR-0568 Allow non-nested variant parts in record types

RR-0577 Allow deferred constant of composite type having a component of an incompletely declared private type

RR-0601 Allow library-level declarations to be defined by RENAMES

RR-0610 Why not allow RENAMES for types and subtypes?

RR-0715 Allow user-defined type conversions and attributes for numeric types

The ability to allow programmers to build user-defined types that have the same attributes and conversion notation as the predefined types is attractive as a generalization of the language's existing capability, but it is unclear whether such changes can be made without introducing anomalies.

AI-00280 Allow pragma OPTIMIZE in package specifications

AI-00404 Use of incomplete private types in generic formal part

This AI illustrates an unintended annoying consequence of the rule restricting the use of an incomplete private type.

AI-00519 Default SMALL should be a power of two times the range

This request reflects the need for fixed point types with maximum accuracy for the specified range. This need is in conflict with the Information Systems need for maximum range with only the specified accuracy.

AI-00812 Attributes SAFE_LARGE and SAFE_SMALL should be static

Additional requests pointing out restrictions that might be eliminated or small functional extensions are listed in separate sections below.

2.2.1 Direct Declaration of Generic Subprogram Bodies

Since subprogram bodies can be declared without first giving a subprogram declaration, it seems inconsistent not to have the same shortcut for generic subprograms.

RR-0426B Allow declaration and body to be combined for generic subprograms

RR-0547 Like non-generic subprograms, allow merge of specification/body for generic subprograms

RR-0604 Like non-generic subprograms, allow merge of specification/body for generic subprograms

AI-00382 Allow generic subprogram bodies

2.2.2 Default Initialization for Any Non-Limited Type

Several requests point out that it seems inconsistent to restrict default initialization just to components of records.

RR-0129 Allow default initialization to be specified for any non-limited type

RR-0161 Allow default initialization for any non-limited type

- RR-0230 Allow initialization to be associated with any type definition
- RR-0456 Allow initialization to be associated with a type definition
- RR-0506 Allow initialization to be associated with a type definition
- RR-0595 Allow default initialization for all types
- RR-0649 Allow default initialization for all types (not just records)
- RR-0677 Allow initialization clauses on scalar type declarations

2.2.3 Restrictions on Subprogram Parameters

The following requests note possibly unnecessary restrictions on subprogram parameters.

- RR-0103A Allow unchecked conversion for IN OUT and OUT parameters
- RR-0239B A renamed type cannot be used in an actual parameter type conversion
- RR-0578 Out-mode parameters of limited private types should be allowed
This RR gives a good example to show why this restriction should be relaxed to allow good modular programming practices to be supported.
- AI-00473 Any form of actual parameter should be allowed as a default parameter
This AI points out an easily fixed inconsistency in the language.
- AI-00840 Allow access OUT parameter as attribute prefix
This AI points out an unneeded and overly restrictive rule.

2.2.4 Extend Use of Representation Attributes

Two requests note that it would be natural and convenient to be able to use representation attributes of composite types in representation clauses.

- RR-0048 Extend static expressions to include representation attributes of composite types
Although the request is phrased in terms of allowing generic formal types to be used in static expressions, the example mainly shows a need to ensure that certain representation attributes can be used in static expressions.
- AI-00539 Allow use of array/record attributes in representation clauses

2.2.5 Allow Use of Private Type Before Its Full Declaration

Several RRs note that it would be convenient to relax the restrictions on the use of a private type before its full declaration.

- RR-0082 Allow declaration of objects of private types in visible package specification
- RR-0542 One way or another allow usage of private type before its completion declaration
The need here may be met indirectly by solutions for User Need U4.3-B. AI-00327 contains more detail about the problem.
- AI-00327 Instantiating with an incomplete private type
This AI is similar to RR-0542, but contains more detail.

2.2.6 Allow Components with the Same Name

Two revision requests point out why it would be useful to allow different variants of a record to have components with the same name.

- RR-0532 Allow same-type record components in different variants to share name
RR-0707 provides a careful analysis of this problem.
- RR-0707 Need same-name component identifiers in different variants
This RR gives a careful analysis of the unpleasant workarounds required today, but it is not clear that the implementation impact of this change would be acceptable.

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2.2.7 Allow Accept Statements in Nested Subprograms

Several RRs point out that it would be convenient to allow accept statements in subprograms nested within a task, simply because of the beneficial effects on program structure.

RR-0543 Allow accept statements in subprograms nested inside tasks

RR-0580 Allow accepts within subprograms/packages nested inside tasks

AI-00214 Allow accept statements in program units nested in tasks

This AI provides another example in the spirit of RR-0543.

2.2.8 Using Real Literals with Fixed Point Operations

One RR and one study AI pointed out that it was natural to allow the use of real literals with fixed point multiplication and division operators, but the current rules forbid such use.

RR-0591 Allow fixed-point multiply/divide with universal real operands

AI-00262 Real literals with fixed point multiplication and division

This AI makes the same suggestion as RR-0591.

2.2.9 Controlling the Effect of Pragma INLINE

These requests, all concerned with obtaining finer control of the effect of pragma INLINE, are concerned with two issues: 1) inlining some but not all calls to the same subprogram body, and 2) controlling whether a subset of overloaded subprograms are inlined. It is easy to program around the first problem. Mark the first subprogram as being inline, and export a second subprogram, with a similar name, which is not marked as being inline and whose body calls the first. For the second case, it is necessary to be sure the subprograms to be inlined all appear first and that maintenance programmers realize that the order of declarations is important (as is pointed out by RR-0687). The issue is one that deserves attention from the Mapping/Revision Team.

RR-0060 Allow inlining of subprograms from some but not all call sites

RR-0398 Need clearer/more selective rules for pragma INLINE applicability

RR-0575 Need better (more selective) control over inlining

RR-0687 Pragma INLINE should not apply to all overloads; only closest

2.2.10 Allow Type Conversions in More Contexts

RR-0510 points out that in linear algebra subprograms, it would be convenient and often more efficient to be able to re-index arrays directly by subtype conversions when selecting a component, e.g.,

```
VEC_TYPE (VECTOR) (I)
```

Of course, one can define a function whose effect is to apply such a subtype conversion, since

```
FUNC (VECTOR) (I)
```

is quite legal, at least in an expression.¹ If this effect can be achieved indirectly, why shouldn't the language allow it directly and efficiently? Type conversions should at least be usable where equivalent functions are allowed.

¹The RR points this out very quietly. Lest the significance of the examples given in the RR be missed, we provide a little extra discussion in this section.

One can even argue that type conversions should be allowed on the left side of assignments since subprogram calls can be used to achieve the same effect, e.g., the function

```
procedure ASSIGN_I (TARGET : in out V_TYPE; SOURCE : in V_TYPE) is
begin
    TARGET(I) := SOURCE;
end ASSIGN;
```

combined with the call:

```
ASSIGN_I (V_TYPE(W), ...);
```

has the same effect as:

```
V_TYPE(W) (I) := ...;
```

Since one is allowed to achieve the effect of assigning to a converted array by using a subprogram call, perhaps the language should allow it directly as well.

2.2.11 Private Task Entries

These requests for the ability of a task to have entries that are visible only within the package in which the task is written would extend the expressive power of the language.

- RR-0090 Allow some task entries to be visible, some not
- RR-0487 Need private task entries for exclusive use within the task
- RR-0628 Need private task entries

2.2.12 Loops over Non-Discrete Types

Several RRs request improvements in the loop construct, including the ability to specify a step size and the ability to loop over a list. The Mapping/Revision Team should determine whether these changes are worthwhile, since they were explicitly rejected during the initial design as not being of sufficiently widespread benefit.

- RR-0317 Augment Ada's looping: over reals, list items, etc
- RR-0615 Define LOOP/UNTIL control structure as in Pascal
- RR-0717 Allow specification of a step size in FOR loops
- RR-0743 Need to allow increment of something other than one in for loops
- RR-0744 Allow for loop to have non-discrete (fixed-point) parameter

2.2.13 Permit Other Bracketing Characters

Several RRs request that programmers be allowed to use parentheses in addition to "...". This may be a reasonable request to consider given the expansion in Ada's character set (see Requirement R3.1-A(1)). On the other hand, the availability of additional bracketing characters might impair readability by allowing divergent conventions for the use of these characters.

- RR-0534 Allow brackets other than "(", ")" in aggregates, etc
- RR-0556 Parentheses are used for too many purposes in the language
- RR-0755 Allow "[" instead of "(" for indexed components

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2.2.14 Internal Coding of Enumeration Values

Although unchecked conversion can be used to get access to the coding of an enumeration value, several requests ask for the ability to access this coding directly.

- RR-0040 Need a way to determine the internal coding of enumeration values
- RR-0059 Need an attribute for returning a representation's underlying value
- RR-0220 Need way to get the internal code associated with enumeration values
- RR-0465 Need a way to get the representation from an enumeration value and vice versa

2.3 Error Detection

User Need U2.3-A: Minimize Consequences of Programmer Error

Study Topic S2.3-A(1) — Improve Early Detection of Errors

Discussions with developers of safety-critical and trusted systems emphasized the need to ensure that Ada compilers detect as many errors as possible. Since this need is not limited to developers of such systems, these requirements² were placed in this Chapter (dealing with general requirements), leaving the Chapter on safety-critical and trusted systems to deal with more specialized requirements. The first requirement deals with compile-time issues, and the second, with limiting the effect of programmer errors at run-time.

Revision requests associated with improving compile-time detection of errors fell into two categories — the reporting at compile-time of potential run-time errors such as exceptions that must be raised, and the rejection of compilation units containing unrecognized or defective pragmas. Both kinds of requests are met by this requirement.

- RR-0165 Allow parameter constraint violations to be compile-time errors
- RR-0209 Require the compiler to report certain-to-be-raised exceptions
- RR-0242 Require compilation warnings for potential run-time errors
- RR-0244B Flag run-time errors at compile-time when possible
- RR-0261 Need compile-time warnings for access before elaboration errors
- RR-0616 Require compilers to diagnose statically-detectable constraint errors

The following requests refer to the treatment of invalid pragmas. The requirement generally goes further than the RRs since it requires a compilation mode in which a compilation is rejected if a pragma is found to be invalid or unrecognizable.

- RR-0211 Require compilers to report unrecognized or incorrect pragmas
- RR-0692 Allow implementation-defined pragmas to cause unsuccessful compilation if restrictions implied by the pragmas are not obeyed
- RR-0754 Require warnings for unrecognized pragmas
- RR-0756 Require warnings when pragmas are ignored
- AI-00850 Rejecting a unit when a pragma's assumptions are not met
This AI is being actively considered by the Ada Rapporteur Group.

²The lack of an initial capital "R" means we are neutrally referring to one of the topics to be addressed by the Mapping/Revision Team without distinguishing whether it is classified as a Requirement or as a Study Topic. This convention was also used in the Requirements Document itself.

Requirement R2.3-A(2) — Limit Consequences of Erroneous Executions

Unlike the previous requirement, this requirement is not presented as a study topic because it is phrased weakly (and hence, is easily satisfied) and because it is clear that some corrections can and should be made to the standard to restrict the allowed effects of erroneous executions under some circumstances.

Two of the revision requests associated with this requirement mention the difficulties caused when a task terminates silently because of an unhandled exception. Although such behavior is not, strictly speaking, erroneous, such run-time behavior leads to effects that can be hard to diagnose. These revision requests are categorized under this requirement because the requirement deals with run-time programmer errors, and the user need is to minimize the consequences of programmer errors. While it is not clear what can be done, solutions to other requirements might help mitigate this problem. For example, if finalization is provided in Ada 9X, the finalization code for a task might log the reason for its termination.

RR-0490 points out some of the ways that improperly written machine code insertions can lead to unpredictable program executions even though the standard does not mention such insertions as a source of erroneous program executions. The RR goes on to suggest that restricted forms of exception handlers be allowed in machine code insertions to facilitate recovery from exceptional situations detected in machine code insertions.

RR-0042 Clarify the meaning of incorrect-order dependence and its effects

RR-0066 Reduce risks associated with erroneous execution/incorrect order dependences

RR-0400 Do not allow a task to die silently on an unhandled exception

It is not clear what can be done, but the RR does point out a problem.

RR-0407B Do not allow a task to die silently on an unhandled exception

It is not clear what can be done, but the RR does point out a problem.

RR-0490 Need successful/convenient recovery from exceptions in machine code insertions

This simple request might improve safety of use of machine code insertions.

RR-0763 Allow nested scopes to turn off pragma SUPPRESS

Enforcing conventions for the correct use of pragma SUPPRESS can be important. The best solution, however, is not necessarily a pragma that turns off the effect of the pragma in a nested scope.

AI-00832 Effect of depending on parameter passing method when calling non-Ada programs

AI-00873 Type conversion/qualification of undefined scalar values

The AI suggests a simple upward-compatible rule change that is consistent with the intent of the Requirement.

2.4 Controlling Implementation-Dependent Choices

User Need U2.4-A: Uniformity of Compiler Behavior

Requirement R2.4-A(1) — Minimize Implementation Dependences

The following requests indicate various areas in which the language might be improved to remove possibly unnecessary implementation-dependent behavior.

RR-0007 Default representation for enumeration types should be specified

The representation for predefined type BOOLEAN should continue to be implementation-defined for efficiency reasons.

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- RR-0045 Allow/require extended precision for intermediate integer results
Extended precision is already allowed, but not required, by Ada; see 11.6(6) of the Standard.
- RR-0061 Make Long_Float and Short_Float required types
- RR-0068 The Standard should explicitly acknowledge that I/O support is optional for embedded systems
Implementation-dependent support for I/O functionality, particularly for implementations targeted to embedded systems, needs more attention.
- RR-0187 Need to allow unsigned enumeration representation specifications
This RR suggests that the representation of enumeration values cannot be controlled adequately since the treatment of sign extension for negative literals is not adequately controlled by the standard. It is not clear that this complaint is justified, but it should be given consideration.
- RR-0236 Reduce implementation-dependent behavior, or at least, ensure it is documented whenever possible
- RR-0287 Make access types point directly to designated object
In some implementations, access values point to dope vectors rather than the designated object. This causes unnecessary implementation-dependence when interfacing with other languages.
- RR-0302 The language should define literals for values of type ADDRESS
- RR-0315 Allow integer type names that indicate representation size, e.g., INTEGER_32, to improve portability
This RR also recommends that the standard state explicitly that the length of LONG_INTEGER not be less than the length of INTEGER, with similar constraints imposed on SHORT_INTEGER.
- RR-0353 Unchecked conversion should eliminate compiler-dependent fields
The RR points out an important problem in dealing with unchecked conversion, although the proposed solution is not necessarily the correct one.
- RR-0355 Standardize means of getting the OS command line arguments
At the very least, compilers running under the same operating system should have the same way of interacting with command line arguments. This RR makes an interesting proposal on how to achieve this effect.
- RR-0365 Reduce allowed variations in implementations to increase portability
RR-0432 is an expanded version of this RR.
- RR-0432 Severely limit implementation options to improve portability
This RR gives a very extensive list of sections in the Standard that allow implementation-dependent choices to be made.
- RR-0459 Improve support for interoperability; lessen implementation dependence
This RR lists several areas for consideration: representation clauses, the effect of pragma PACK, the effect of unchecked conversion, and permissible optimizations. An extensive and helpful discussion is provided.
- RR-0709 Need more portability in getting command line inputs
See RR-0355 for specific suggestions.
- RR-0732 Clarify semantics of instantiating ENUMERATION_IO with an integer type

There were two requests to specify the rounding behavior for half-integers and one request to at least document the behavior.

- RR-0213 Need to be able to find out if an implementation rounds up or down
- RR-0409 Define in the language how 3.5 rounds to integer
- AI-00526 Rounding up or down

Two requests asked to make record representation clauses less implementation-dependent in their interpretation.

- RR-0137 Standardize bit storage/order conventions

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RR-0411 Express record representation clauses in a machine-independent way

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3 Requirements for International Users

3.1 International Character Sets

The requirements specified in this section of the Requirements Document reflect extensive interactions with the international community via the Character Rapporteur Group (CRG), a subgroup of the ISO Working Group responsible for the Ada standard.

User Need 113.1-A: International Character Set

The following revision requests are reflected in each of the requirements stated in this Chapter.

RR-0330 Allow national characters in literals, comments, and identifiers
This request is addressed by Requirements R3.1-(A1-5).

AI-00510 Use ISO symbols and standards in the Ada ISO Standard
This commentary also requests that national alphabets be usable in identifiers, character literals, string literals, and comments. All of these requests are addressed by Requirements R3.1-A(1-5).

Requirement R3.1-A(1) — Base Character Set

The precision of this requirement reflects a decision by the CRG. If the CRG should subsequently revise this decision, it is intended that the Mapping/Revision Team take this into account. The CRG gave specific consideration to the idea of defining STANDARD_CHARACTER as a 128-character subtype of a 256-character type but rejected this approach because it was strongly desired that the predefined STRING type allow string literals drawn from a 256-character set.

The following revision requests are relevant to this requirement.

- RR-0034 Ada should use ISO 8859/1-9 (8-bit) character set
- RR-0148 Provide support for extended and graphic characters (256 ASCII set)
- RR-0311 Generalize character set for 8-bit characters
- RR-0367 Need support for national language character sets, including string comparison
The request for string comparison operations was not accepted, for reasons given in the Requirements document in the discussion following the requirement.
- RR-0390 Need 8-bit unsigned CHARACTER for Greek and graphics symbols
- RR-0736 Need 8-bit ASCII in Ada
- AI-00420 Allow 256 values for type CHARACTER

Requirement R3.1-A(2) — Extended Graphic Literals

The following revision requests are reflected in the requirement for providing extended character set types.

- RR-0050 Provide multi-national and multi-byte characters
- RR-0331 Need predefined LONG_CHARACTER (16 bits) and LONG_LONG_CHARACTER (32)
- RR-0438 Allow use of multi-octet character set

Requirement R3.1-A(3) — Extended Character Set Support

Although no revision requests were submitted calling just for support of input/output operations using international character sets with more than 256 graphic symbols, this requirement reflects other communications from the international community and RR-0330.

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Requirement R3.1-A(4) — Extended Comment Syntax

As part of a complete solution to the use of Ada by non-English-speaking programmers, the ability to write comments in the programmer's native language is important. Although this requirement is already, in principle, satisfied by the current standard (see AI-00339), it was stated explicitly in the Requirements Document lest it be thought to have been excluded intentionally.

Study Topic S3.1-A(5) — Extended Identifier Syntax

The CRG has explicitly asserted that it is not desired to translate reserved words. In particular, although it may be helpful to have unreserved identifiers rendered in an extended character set, representatives of the international community have indicated that translation of reserved words is not desired because it would impair the interchangeability of programs. The requirement implies that reserved words should not be translated because it states that Ada's syntax and lexical rules must be kept independent of the source code representation.

4 Support for Programming Paradigms

4.1 Subprograms

User Need U4.1-A: Dynamic Subprogram Selection

Study Topic S4.1-A(1) — Subprograms as Objects

The programming paradigm known as object-oriented programming has become much more widely known since Ada was designed. One of the key issues in formulating the Ada 9X requirements was the extent to which Ada 9X should support the object-oriented paradigm. In discussions during the requirements phase, it became clear that it would be a mistake to use the term "object-oriented" directly in any requirement because there was insufficient consensus on what language capabilities were implied by the term. Hence we developed requirements that specified capabilities consistent with some views of object-oriented programming without directly using the term. The ability to treat subprograms as values of variables is one such capability that can be used to provide functional capability equivalent to the kind of polymorphism provided in some object-oriented programming languages (e.g., by writing `Obj.Func(Obj, ...)`). For full polymorphism, Ada's strong typing rules must be relaxed in some way (see Study Topic S4.3-B(1)). Several revision requests directly called for subprogram variables.

RR-0081 Provide subprogram and package types

Subprogram types is an obvious solution to this requirement. The RR is very short and provides no arguments explaining the need for package types.

RR-0430A Need objects of a subprogram "type"

RR-0441 Extend Ada to allow for polymorphism

RR-0503 Provide subprogram types for dispatcher-style programming

This RR was particularly useful in formulating the associated User Need and requirement.

RR-0563 Need to allow subprogram types and variables

RR-0611 Allow subprogram types, variables, constants, parameters, etc

This RR was helpful in formulating the associated User Need and the requirement.

RR-0647 Need ability to select actions depending on state without using case statements

User Need U4.1-B: Interfacing with Non-Ada Subprograms

Requirement R4.1-B(1) — Passing Subprograms as Parameters

Since the requirement for subprogram variables was classified as a Study Topic, and since the ability to pass subprograms as parameters to non-Ada procedures and functions was clearly needed and could be supported with a simpler mechanism than subprogram variables, a separate Requirement was written to cover this need. If it proved too difficult to support subprogram variables directly in Ada, at least Ada 9X would provide a standard way of passing subprograms to non-Ada procedures and functions.

RR-0064 Allow some form of subprogram callback

RR-0128 Provide subprograms as parameters to subprograms and entries

RR-0180 There is a need for procedures as parameters for X-Windows, etc

RR-0388 Proposal for clean way of executing a subprogram by its address

A straightforward subprogram type provides a simpler solution than the approach proposed in this RR.

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- RR-0414 Ada needs subprogram types and subprogram objects
- RR-0422 Allow subprograms as parameters and maybe also as values
- RR-0430B Need to pass subprograms as parameters
- RR-0512 Provide subprograms as parameters to subprograms
This RR gives some examples of the limitations of using generic parameters as a means of getting the effect of passing subprograms as parameters.
- RR-0629 Need procedure and function types for use in subprogram calls
- RR-0641 Add subprograms as parameters to the language
- RR-0774K Allow subprograms as parameters

Requirement R4.1-3(2) — Pragma INTERFACE

The Ada 9X study report on implementation-dependent pragmas and attributes [7] showed that it would be helpful to impose a greater degree of compiler uniformity on the functionality associated with pragma INTERFACE. Although this requirement could have been subsumed under Requirement: R2.4-A(1) (Minimize Implementation Dependences), it seemed appropriate to mention it in a section dealing with subprogram requirements.

- RR-0014 Need to call subprograms loaded in ROM
Ada 9X could ensure that pragma INTERFACE is usable to identify subprograms located in ROM.
- RR-0527 Standardize information/conventions used for pragma INTERFACE

4.2 Storage Management

User Need U4.2-A: Control of Storage Use

Requirement R4.2-A(1) — Allocation and Reclamation of Storage

Various revision requests point out how Ada programmers are not necessarily given sufficient control over storage usage, and in particular, how some implementations do not take sufficient care to recover unused storage.

- RR-0112 Provide user support for controlled space reclamation
This RR provides an example user interface for controlling storage allocation and reclamation.
- RR-0113 Ensure that there are no storage "leaks"
This RR gives some examples of how storage leaks can occur.
- RR-0118 Provide a user-specified storage reserve for STORAGE_ERROR recovery
This capability could be automatically made available if Ada 9X allowed user-defined storage management operations to be written.
- RR-0120 Allow users to defer the signalling of STORAGE_ERROR when space is exhausted
The problem can be solved in its full generality only by customizing a storage allocator.
- RR-0370E Need to recover space for task control blocks when tasks are created by an allocator
- RR-0374 Ada should address memory management requirements in distributed systems
- RR-0439 Require automatic garbage collection
- RR-0493 A programmer should be able to ensure that storage will be reclaimed
- RR-0643 Garbage collection can now be done well; encourage its use
Section 4.2 of the Requirements Document addresses this topic further.
- RR-0702 There is a need for improvements in heap storage management
- RR-0774A Make it possible to write NEW in Ada

Study Topic S4.2-A(2) — Preservation of Abstraction

User-defined assignment was almost provided in the original design of Ada. The design team, however, did not take this step because there was insufficient time to be sure that its inclusion would not lead to implementation inefficiencies or other anomalies. An effort was made, however, to make it as easy as possible to allow user-defined assignment operations when the language was revised.

The Requirements Team could have articulated a general requirement for capabilities allowing user-defined types to be indistinguishable from pre-defined types. Such a requirement would have entailed the ability to specify user-defined basic operations, including assignment, conversion, and various attributes. The Team did not develop such a requirement because it might have required a more complicated language change than would have been justified by Guideline G-1. However, it was clear that the ability to control the use of storage was very important in many applications, so the Team instead developed a requirement that addressed primarily this need. It was stated as a Study Topic because of misgivings over the possible scope of changes that might be needed; we made a conscious decision that if the need for user-defined storage management could not be supported with minimum disruption to the language and implementations, we would be willing to live without the capability. Since the ability to recover unused storage requires the ability to get control when frames are being exited, this requirement would also allow the concept of finalization to be supported by the revised language. This concept, of course, has greater utility than merely supporting user-defined storage management, but given our concerns over the ability to support finalization with no costs if it was not used, we were unwilling to mention it directly in the requirement and were, in any event, unwilling to give it great urgency.

Several revision requests asked for user-defined assignment and finalization in conjunction with storage management issues, while others just asked for the capabilities on general grounds of expressive power and support for programming abstraction.

RR-0001 Limited types need assignment, constants

RR-0070 Allow user-defined assignment for limited types

RR-0088 Problems associated with user-defined assignment

This RR points out some problems to be addressed if user-defined assignment is added to the language.

RR-0160 Allow user-defined assignment for limited types

RR-0184 Need user-defined assignment operator for limited private type

RR-0201B Overload the assignment operation

RR-0202 Relax parameter mode rules for limited types that have an assignment operation

These problems will be addressed by allowing user-defined assignment for limited types.

RR-0413 Allow user-written := for all types

RR-0515 Need ability to request indivisible update for specific objects, especially in distributed systems

The submitter objects to the need to explicitly program mutual exclusion when making assignments to specific objects, and would like to have the assignment operation imply indivisible update. This capability could be provided by user-defined assignment.

RR-0541 Allow user-defined :=, =, DESTROY operations to support memory management

This RR gives a very lengthy discussion and examples showing why user-defined assignment and finalization are needed to provide appropriate memory management functionality under user control.

4: Support for Programming Paradigms

RR-0544 Need indivisible update on reference counts

This RR briefly discusses the difficulties of maintaining reference counts for data shared among tasks. It may provide an interesting example to use when evaluating Ada 9X solutions.

RR-0609 Allow user-defined override of =, /=, := on all types

RR-0663 Allow certain overloading of := and subscripting

User-defined subscripting is not required.

RR-0669 Allow user-written := routines

Other revision requests asked for a "finalization" capability, which is also needed to control the use of storage safely.

RR-0003 Provide a compiler-independent finalization mechanism

See the discussion following the Study Topic.

RR-0019 Allow types to specify finalization procedures for safely controlling use of collections

RR-0092 Allow user-specified finalization

RR-0168 Allow implicitly-invoked finalization code for storage management

RR-0203 Allow finalization code for packages and tasks

RR-0385 Need finalization code for packages

RR-0466 Allow user-defined finalization for objects of a type to ensure release of resources

RR-0475 Need automatically-invoked user-defined routines to reclaim storage

RR-0523 Allow user-defined finalization for objects of a type to ensure release of resources

RR-0660 Need constructors and destructors for package types

RR-0676 Add finalization to ensure release of resources

RR-0774N Allow task cleanup on termination of parent

Finalization is one of the matters to be studied.

4.3 Composition of Program Units

User Need U4.3-A: Reduced Recompilation

Study Topic S4.3-A(1) — Reducing the Need for Recompilation

Various RRs give examples of language rules that lead to an increased need for seemingly unnecessary recompilation.

RR-0142 Reduce cases where recompilation of subunits is needed

This RR gives some examples of the kinds of program changes that should not force recompilation.

RR-0307 Allow completion of private declarations to be in the package body

The RR gives a reference to a paper justifying a conclusion that efficient code can be generated even if a private type's full declaration is given in a package body.

RR-0368A Ensure unnecessary recompilation is avoided

RR-0451 Changes to package constants should not cause recompilation

RR-0688 Unnecessary recompilation required when redeclaring a subprogram body

This RR gives an example where recompilation should not be required.

User Need U4.3-B: Programming by Adaptation of Existing Units

Study Topic S4.3-B(1) — Programming by Specialization/Extension

The ability to extend packages without modifying the original package (this is an example of what is called "inheritance" in object-oriented terminology) can reduce the need for recom-

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pilation (see Study Topic S4.3-B(1)). To avoid preconceptions about object-oriented programming mechanisms, this study topic simply states one of the significant capabilities provided by inheritance mechanisms. In this way, the requirement focuses on the functional capability that is needed.

Some revision requests asked directly for inheritance mechanisms:

- RR-0125 Introduce object-oriented inheritance into the language
- RR-0140 Provide support for object-oriented programming
- RR-0167 Allow classes of abstract data types
- RR-0223 Need to add inheritance to support object-oriented programming
- RR-0440 Extend Ada to be truly object-oriented
- RR-0442 Extend Ada to allow a package type hierarchy
- RR-0516 Provide more support for object-oriented programming
- RR-0525 Extend Ada to allow for polymorphism and inheritance
- RR-0662 Need package classes and inheritance for object-oriented programming
- RR-0668 Need package types to get, for example, an array of packages
The requirement provides much of the requested functionality.
- RR-0750 Add support for inheritance and polymorphism to the language

Other requests noted special problems that should be considered in developing a response to the Study Topic. In particular, several requests were concerned about the ability to develop operations for types declared in one or more packages.

- RR-0052 Multiple derived types from same package do not give desired operations
RR-0482 contains a better example and motivation.
- RR-0482 Multiple derived types from same package do not generate needed operations
Specialization/extension facilities should help solve this problem.
- RR-0533 Mutually recursive types from different packages cannot be done
This is an example of a problem that might be solvable with suitable facilities for specializing/ extending packages and types.

Some requests wanted the ability to separate implementation-dependent aspects of a package from implementation-independent aspects. This requirement might well be met with an appropriate specialization/extension capability.

- RR-0065 To improve reuse possibilities, allow rep clauses and various pragmas to be separated from the compilation unit to which they apply
- RR-0171 Allow target-dependent code (including rep clauses) to be separate from other code
- RR-0698 Need ability to separate portable and non-portable code into separate units

Some requests noted the need to extend the representation of a private type. This is a special need that falls under the stated requirement.

- RR-0560 Need to access a private type's representation in related packages
- RR-0684 Related packages need access to a private type's representation

Finally, there were a few requests that reflected the Study Topic fairly directly.

- RR-0069 Allow subprograms and types to be added to a package without modifying the original package
- RR-0172 Make import and export of types easier

4: Support for Programming Paradigms

RR-0174 Allow packages to be generic with respect to concurrency protection

This is a good example of a form of specialization that is often needed.

RR-0448 Allow different sets of subprograms to depend on common declarations

RR-0455 The import and export mechanisms of Ada are too limited

This RR contains a fairly extensive discussion of problems that are relevant to the Study Topic.

RR-0505A Provide extendable record types

RR-0531 Variants of a type can't be usefully supported with current variant record approach

Although this RR discusses variant record limitations, the real problem being addressed is the ability to construct efficiently representable alternative representations for a conceptual type. The RR mentions explicitly that object-oriented languages allow this kind of problem to be solved more straightforwardly.

RR-0540 Allow a new package to build on an existing package

RR-0599 Certain changes to derived/private types will help inheritance

This RR gives some generic examples of difficulties of extending existing units to meet new needs.

User Need U4.3-C: Library Support

Study Topic S4.3-C(1) — Enhanced Library Support

These revision requests discuss various ways in which Ada's support for libraries might be improved.

RR-0091 Don't specify the compilation process in the Standard

RR-0177 Standardize interface between compiler and library for configuration management

RR-0226 Need standardized support for improved library management capabilities

Presents a reasonable discussion of library management needs.

RR-0237 Make separate compilation independent of a particular library model

RR-0283 Need convenient way to set global compilation parameters

RR-0368B Ensure the library can be manipulated by tools other than those provided by the compiler vendor

Quite a few RRs asked for more flexibility in restricting the visibility of library unit names.

RR-0073 Allow visibility of names to be restricted within a program library

RR-0178 Problems with name clashes with big program libraries

RR-0457 Structure library units as groups, control visibility of library units

RR-0774C Extend control of library unit visibility

Finally, there were many RRs that asked to relax the rule requiring that subunit names be distinct within a given subunit hierarchy.

RR-0038 Allow expanded instead of simple names of subunits to be distinct

RR-0041 Allow overloaded subunits with respect to a common ancestor library unit

RR-0402 Need unique hierarchical pathnames for subunit

RR-0557 The use of renaming declarations to provide subprogram bodies helps get around the inability to overload subunit names

AI-00458 Problem with naming of subunits

4.4 Generics

User Need U4.4-A: Support for Reusability

This User Need deals primarily with improving the use of generic units.

Study Topic S4.4-A(1) — Generic Formal Parameters

This requirement was classified as a Study Topic because it is unclear to what extent changes to generic formal parameters are needed given Study Topic S4.3-B(1). Moreover, it is unclear whether the proper solution to the needs reflected in the revision requests is to allow additional forms of generic parameters or simply to relax the matching rules, thereby allowing a wider use of formal parameters within a generic unit even though some instantiations may then become illegal.

The following revision requests essentially asked for a weakening of the generic contract model.

RR-0458 Need convenient way to escape into weakly typed subprogram call

RR-0713 Relax array matching rules for generics

Several requests asked for the ability to pass an exception to a generic unit so the unit could raise the exception or so an exception raised by a formal subprogram could be handled within the unit.

RR-0033B Need to pass exceptions to subprograms and generic units

RR-0101B Need to pass exceptions as parameters to generic units and subprograms

Most of this RR deals with the ability to group exception names.

RR-0228 Allow generic parameterization with exceptions

RR-0383 Need generic exceptions for truly reusable generic units

RR-0468 No generic way to handle exceptions raised by generic formal subprograms

RR-0526B Need to pass exceptions as parameters to generic units and subprograms

RR-0621B Permit exceptions as generic formals

RR-0671 Allow exceptions as generic parameters

RR-0706 Allow exceptions and packages as generic parameters

RR-0774J Allow generic parameters for any Ada entity, e.g., exceptions

Three requests dealt with the need to improve the treatment of staticness within generic units. See RR-0342 for concerns about how allowing a greater use of static expressions in generic units might impair the ability to share code for generic instances.

RR-0227 Allow generic parameterization with static numeric quantities

RR-0445 Non-staticness of generic formals poses problems

This RR argues that it should generally be possible to turn a non-generic unit into a generic unit, but this is not easily possible when the non-generic unit uses static expressions (in case statements, aggregates, and type declarations) that depend on formal parameters in the generic version.

RR-0712 Need ability to declare double precision numeric types within a generic unit

The problem here is mainly the inability to create new numeric types whose precision is a function of a generic formal type. Relaxing the rules concerning static expressions would help in the creation of numerical library packages.

Several requests noted that actual entry parameters could not be used in timed or conditional entry calls within a generic unit. AI-00451 points out that such calls are sometimes needed to avoid deadlocks.

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RR-0408 There is a need for generic formal entries

RR-0486 Allow generic formal task types as well as generic formal limited types

This RR points out that if a generic unit expects a task as an actual parameter, the programmer is unable to express this requirement.

RR-0488 Allow generic formal entries as well as generic formal subprograms

This RR gives an example of how a generic formal entry would be used to achieve the effect of an asynchronous call.

RR-0659 Need to make entry call on a generic formal parameter

AI-00451 Task entries as formal parameters to generics

This AI discusses some workarounds that are needed if entries are not distinguished as generic formal parameters.

There were a number of requests to generalize generic units so record types could be handled. It is not clear that this is advisable, but this is for the Mapping/Revision Team to determine.

RR-0027 Improve generics so a generic report generator could be written

RR-0505B Allow partial match for records as generic parameters

RR-0627 Allow partial match to formal type for records

RR-0722 Need generic formal record types

AI-00452 Allow record types as generic formal parameters

These requests give useful examples showing why it is necessary and useful to be able to access numeric base types within a generic unit.

RR-0190 Allow use of a base type within a generic unit

RR-0511 Allow use of a base type within a generic unit

AI-00285 Need to be able to access a base numeric type in some algorithms

This AI gives an example of the difficulties of getting access to a numeric base type, which was needed when trying to write TEXT_IO.FIXED_IO in Ada.

AI-00291 Can't define a generic package that works for all floating point types

User Need U4.4-B: Independent Use and Implementation of Generics

Requirement R4.4-B(1) — Dependence of Instantiations on Bodies

There was only one revision request directly related to this requirement.

RR-0562 Require separate compilation of generic specifications and bodies

Study Topic S4.4-B(2) — Tighten the "Contract Model"

All but one of the revision requests relevant to this requirement are concerned about the fact that the legality of a generic instantiation can depend on the use of a generic formal parameter in the generic body, namely, an object of a generic formal type cannot be declared legally if the corresponding actual type is an unconstrained array type (e.g., STRING) or an unconstrained record type without default discriminants. RR-0584 notes additional possibility for error due to allowed mismatches between formal and actual parameter subtypes.

RR-0006 Distinguish unconstrained/constrained generic formal types

RR-0446 Tighten the contract model by distinguishing constrained/unconstrained generic types

RR-0472 Distinguish unconstrained/constrained generic formal types

RR-0549 Ensure the use of unconstrained actual types is always legal

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RR-0584 Need stricter checking of formal generic subtypes when an instantiation is given

This RR provides a careful discussion of an error-prone aspect of generics, namely, the fact that formal subtypes are sometimes ignored in matching actual parameters.

User Need U4.4-C: Code Space Compactness

Requirement R4.4-C(1) — Generic Code Sharing

The relevant revision requests point out some difficulties in supporting generic code sharing.

RR-0005 Exception declarations in generic packages make code sharing unnecessarily difficult

RR-0342 Do not implement requests that will break generic code sharing

This RR discusses how changes in the rules for treatment of static types and expressions could impair generic code sharing possibilities. The RR discusses the potential effect of RR-0027 and RR-0048.

RR-0585 Need pragma to specify code-generation strategy for generic instantiation

RR-0586 Different instantiations of the same generic unit may have to evaluate their actual parameters in different orders

The RR asserts that for a stack machine, this causes inefficiencies for shared-code generics.

4.5 Exceptions

User Need U4.5-A: Exception Name

Requirement R4.5-A(1) — Accessing an Exception Name

There were many revision requests that asked for the ability to get the name of a raised exception while executing a handler for that exception. Some of the requests asked for additional contextual information as well. The Requirements Team decided that the name of a raised exception could be provided easily by implementations, but that to go any further would probably incur more costs in language and implementation complexity than would be worthwhile.

RR-0033A Need to find the name of a raised exception

RR-0085 Need to get the name of the current exception

This RR gives some valid reasons for accessing the name of an exception.

RR-0145 Provide a way to get exception name from WHEN OTHERS handlers

This RR references a POSIX requirement for the ability to print the name of an exception from within an OTHERS handler.

RR-0219 Provide a way to get the name of the last raised exception, including an out-of-scope exception

RR-0403 Need to be able to get the name of the current exception

RR-0407A Need exception name, line number, and unit name where raised

This RR cites a requirement for logging exception information in information systems. The 9X requirement, however, does not go so far as to request contextual information such as the name of the compilation unit, source code line, etc. The requirement allows additional information to be made available if this can be done with little implementation cost.

RR-0477 Provide a way to get the name and location of a raised exception

Obtaining traceback information is not part of the 9X requirement.

RR-0526C Need to determine the name of a raised exception

RR-0582 Provide standard interface for getting additional implementation-dependent info about state when an exception is raised

The requirement allows additional information to be made available if this can be done with little implementation cost.

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RR-0621A Need to find out which exception has been raised

RR-0772 Need to be able to get exception name in a handler

RR-0774E Provide access to context of an exception situation

The requirement allows additional information to be made available if this can be done with little implementation cost.

RR-0774G Provide exception name in OTHERS handler

In addition to requests for the name of a raised exception, there were several requests asking for a way to group exceptions; the requests were not included in a 9X requirement because such a change was not considered to provide enough user benefit to justify disturbing the language, given other changes already reflected in the requirements. Two requests asked for finer granularity in the predefined exceptions, but this issue was given sufficient consideration in the original design and the revision requests did not provide sufficient rationale for re-examining this decision.

RR-0036 Allow exceptions to be grouped under a single name by allowing exception subtypes

RR-0101A Allow exceptions to be grouped under a single name

RR-0416 Granularity of predefined exceptions is too coarse

This issue was given thorough consideration in the original design, and insufficient evidence is given in this RR to justify reconsidering the decision.

RR-0526A Allow exceptions to be grouped under a single name

RR-0774H Provide more predefined exception names with finer granularity

This issue was given thorough consideration in the original design, and insufficient evidence is given in this RR to justify reconsidering the decision.

4.6 Input/Output

User Need U4.6-A: Interactive Text Input/Output

Requirement R4.6-A(1) — Interactive TEXT_IO

The requirement and the associated revision requests point out potential areas for improvement in the TEXT_IO package to support interactive I/O more conveniently. The following RRs should be considered in responding to this requirement.

RR-0047 Add TEXT_IO.GET functions

There might be some benefit in this suggestion to add value-returning subprograms to TEXT_IO given that a variable length string package is uniformly available.

RR-0149 Provide a keyboard input/output package

RR-0164 Provide multitasking terminal I/O in TEXT_IO

RR-0235 Need support for interactive terminal input/output

RR-0597 Need functional version of GET_LINE instead of procedural

RR-0047 gives a stronger justification for this change.

AI-00485 Having independent standard input and output files is not useful for interactive I/O

AI-00488 Skipping of leading line terminators in GET routines causes problems in interactive I/O

One RR related to interactive input-output goes beyond the intent of the requirement by requesting a special package of screen management functions. This request was not accepted.

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RR-0089 Provide facilities for I/O screen operations

Although there is a requirement for improved interactive text I/O functions, this request goes too far by asking for a screen management package. Text I/O is only intended to provide common, basic functionality.

User Need U4.6-B: Various Input/Output Functions

Requirement R4.6-B(1) — Additional Input/Output Functions

Several requests asked for simple functional extensions:

RR-0207 Add TEXT_IO support with Exists function and Append procedure

RR-0382 Need to be able to rename and append to a file in standard Ada

RR-0404 Need convenient way to find out if a particular file exists

RR-0405 Need convenient way to append to a file

RR-0420 Need file "extend" or "append" capability

Two requests note that the definition of GET_LINE makes it inconvenient to use when the buffer length is equal to the line length, since the final page and line terminator is skipped automatically in this case. It would be more consistent to most users if automatic skipping only occurred for initial terminators, as for other TEXT_IO operations, although one comment notes that skipping leading terminators can also be inconvenient for interactive I/O (see AI-00488).

RR-0553 GET_LINE should not automatically call SKIP_LINE

AI-00605 GET_LINE skips terminators at the end of the line, which is inconsistent with other GET procedures

Two requests noted an inconvenience in the way the default formats for INTEGER_IO, FLOAT_IO, FIXED_IO, and ENUMERATION_IO are controlled by a programmer. RR-0484 proposes a simple upward compatible improvement.

RR-0130 Replace DEFAULT_xy variables in Chapter 14 by functions

RR-0484 proposes a better change.

RR-0484 Add DEFAULT_xy functionality as parameters to generic TEXT_IO packages

This RR proposes a simple, upward-compatible solution that improves the usability of the numeric IO packages.

The remaining requests cover a range of possible functional improvements.

RR-0159 Add standard package of general file system functions

RR-0295 Create TEXT_IO.PUT_LINE for types other than string (make like PUT)

The operations called for here arguably improve the uniformity and teachability of TEXT_IO, but might also be considered to clutter the definition.

RR-0359 Allow mixed case output for enumeration literals

RR-0361 Increase the number of options for controlling the output format of numbers

RR-0447 Need to be able to preserve/restore the default file at any point

This RR provides a useful argument for the requested capability.

RR-0485 Provide means to get the line length of an input or output device

RR-0551 Need assignment capability for TEXT_IO.FILE_TYPE

See RR-0447 for a workaround that can be used today.

RR-0593 Mandate implementation of variant record I/O in DIRECT_IO/SEQUENTIAL_IO

The required functionality is available in principle by using "shared files", as suggested in the discussion following Requirement R4.6-B(1).

RR-0711 I/O by a task in multi-task application should not block whole program

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AI-00329 Look-ahead operation for TEXT_IO

AI-00345 Record type with variant having no discriminants
The principle requested use for untagged variants is for I/O.

AI-00487 END_OF_PAGE and END_OF_FILE should not return TRUE when there is still an empty line to be read

5 Real-Time Requirements

5.1 Time

User Need U5.1-A: Time Measurement

Requirement R5.1-A(1) — Elapsed Time Measurement

The requirement for measuring elapsed time stems mainly from interactions with the real-time community, e.g., as documented in [5]. The revision requests listed here refer mostly to the ability to ensure that applications have sufficient control over clock precision. These RRs should be considered in evaluating proposed solutions to the timing requirements.

RR-0105 Allow application to set/adjust clocks

The ability to adjust the elapsed time or time-of-day clocks is implicit in the stated requirement.

RR-0107 Allow application to specify clock timing interval if hardware allows this flexibility

RR-0276 Need user specified accuracy and precision control over timing

RR-0280 Short delays are too inefficient; Calendar time unnecessary; timing performance must be documented

The general tenor of this request is that Ada's timing model is not appropriate for embedded real-time systems, but the purpose of the requirements is to ensure that the Ada 9X model indeed is appropriate.

AI-00223 Require adequate resolution for the function CLOCK

User Need U5.1-B: Periodic Computation

Requirement R5.1-B(1) — Precise Periodic Execution

Several revision requests support the stated requirement.

RR-0108 Need to be able to wake up a task at a particular local time

Provides a good discussion of some of the issues.

RR-0306 Need to be able to start processing at a particular time of day

RR-0352 Require Calendar.Clock to return consistently accurate local system time

A real-time annex should specify constraints on timing accuracy.

RR-0410 Provide explicit language support for periodic tasks

This RR goes beyond the requirement since it requests direct language support for specifying task periodicity. The arguments should be considered, however, in evaluating Ada 9X proposals.

User Need U5.1-C: Overrun Detection and Response

Requirement R5.1-C(1) — Detection of Missed Deadlines

The need to deal with missed deadlines arose mainly from interactions with real-time users, but there were a few revision requests that stated this need.

RR-0384 Cannot write subprogram which causes an exception after specified delay

RR-0656 Need timed exceptions for deadline scheduling

The requirement should provide the requested functionality.

5: Real-Time Requirements

5.2 Task Scheduling

User Need U5.2-A: User-Controlled Scheduling

Requirement R5.2-A(1) — Alternative Scheduling Algorithms

There were many revision requests that, in essence, asked for greater control over run-time system decisions. Two requests explicitly asked for the definition of a standard run-time system interface as the solution to this need.

RR-0074 Define a standard run-time support environment interface

RR-0175 Define interface between compiler- and target-specific run-time system aspects

The possibility of a standardized RTS interface is discussed under this requirement.

Several requests wanted to ensure that task scheduling and the use of hardware resources by the run-time system could be completely controlled by an application.

RR-0016 Allow user-selectable task scheduling algorithms

RR-0037 Allow tasks (i.e., delays) to execute using simulated time rather than a real-time clock

An application-controlled scheduling interface might allow tasks to execute in simulated time, although such a capability goes beyond the intent of the stated requirement.

RR-0121 Provide more user control over scheduling decisions

RR-0124 Ensure that code dependent on task scheduling algorithms is portable

Although this RR discusses AI-00594, which is not an approved AI, the concern of the RR is reflected in its title. This concern has been addressed by the notion of a real-time Annex for Ada 9X, since one purpose of the annex is to improve the performance portability of code. In addition, the requirement for user-controlled scheduling algorithms makes portability more possible.

RR-0170 Permit or provide alternate scheduling algorithms

RR-0286A Embedded system users need the ability to control timer utilities

RR-0286B Embedded system user may need access to interrupts that are also used by the run-time system

RR-0286C Run-time system should avoid entering privileged mode

RR-0379 Application should select the specific scheduling algorithm

Other requests dealt with specific schedulability issues. Some requests were concerned with the ability to specify task priorities in a more flexible fashion. Although most of the requests were concerned with changing priorities at run time due to mode changes, one RR also noted that requiring the static specification of a task's priority was unhelpful during system integration or reconfiguration (see RR-00654) since a task's priority might be determined at load time.

RR-0020 Relative importance of functions may change during program execution, so priorities should be changeable

RR-0116 User-modifiable priorities needed for mode change and graceful degradation

This RR gives brief examples supporting the stated need.

RR-0192 Need ability to change priorities during mode change and for graceful degradation

RR-0337 Provide some form of user-modifiable priorities

Both mode changes and graceful degradation are mentioned in examples.

RR-0347 Allow applications to change priorities under program control; allow task priority to increase as a function of lack of service

RR-0370D Need to set priorities of tasks during mode shifts

RR-0654 Need non-static priorities

This RR notes, in effect, that the appropriate priority of a task depends on what other tasks are executing on the same processor, and this might change during system development, maintenance, or run-time configuration, in which case, the language is too restrictive in requiring that priorities be specified with static expressions.

Several requests were concerned with the use of priorities in determining which task to select from an entry queue or from open alternatives of a selective wait. Some requests asked that Ada 9X support the special scheduling algorithm known as priority inheritance.

RR-0015 Allow task priorities to control all queuing/select decisions

RR-0021 Need priority inheritance for server tasks

RR-0072 Prioritized queues and priority inheritance are needed for real-time applications

RR-0075 Queue entries by task priority or FIFO based on application

RR-0076 Allow selection of entry calls from entry queues and open alternatives based on priorities

RR-0193 Allow priority queues, priority inheritance, and prioritized treatment of open select alternatives

RR-0415 Allow priority inheritance, prioritized entry-queues, and prioritized selective wait

RR-0657 Order entry queues based on priority

RR-0737 Allow reliable user control over selection of alternatives in a select statement

The RR explicitly notes that the 'COUNT' attribute is not sufficient to ensure the requested degree of control.

Requirement R5.2-A(2) — Common Real-Time Paradigms

Most revision requests asked for support for mutual exclusion that would be more efficient and more natural than the use of rendezvous:

RR-0084 Specify standard conventions for using tasks that permit high-performance implementations

The intention here is to specify, in a real-time annex, the restrictions on task usage that allow tasks used for mutual exclusion to be implemented with special efficiency.

RR-0185 General Ada rendezvous is slow; semaphores would be better

RR-0241 Need easier and more efficient support for mutual exclusion

RR-0278 Tasking model should support common scheduling disciplines more easily

RR-0461 Provide standard package of semaphore operations

RR-0521 Need more convenient support for use of shared memory among tasks

RR-0590 Need clear, efficient, standard support for mutual exclusion

This RR gives a detailed example of a problem that is to be solved by improved mechanisms in Ada 9X.

Three requests asked for the ability to combine entry calls and accept statements in a single selective wait.

RR-0498 Make selective wait symmetrical with respect to accept statements and entry calls

RR-0658 Allow accept statement possibility in a conditional entry call

RR-0697 Allow entry call alternative in selective wait

RR-0498 provides a rationale for this capability.

5: Real Time Requirements

5.3 Asynchronous Control of Execution

User Need U5.3-A: Asynchronous Control of Execution

Requirement R5.3-A(1) — Asynchronous Transfer of Control

Several revision requests addressed the need for an efficient, user-controlled mechanism for terminating and restarting task executions.

- RR-0063 Protect tasks from being aborted while performing critical functions
Although this request is phrased in terms of protecting a task from being aborted, the underlying need is met by the Ada 9X requirement.
- RR-0083 Provide asynchronous transfer of control via entry call/selective wait construct
The proposed solution is attractive.
- RR-0106 Provide asynchronous transfer of control
This RR contains a good rationale and good examples dealing with the need for asynchronous transfer of control.
- RR-0196 Endorsement of RR 0083
This RR endorses the solution suggested in RR-0083 and repeats some material found in [8].
- RR-0335 Effect of abort statement is too implementation-dependent
The requirement addresses the problem raised in the RR.
- RR-0431 A terminate alternative cannot be used to stop cyclic tasks
An asynchronous transfer of control construct might serve to meet the need described here.
- RR-0651 Allow one task to raise an exception in another task
A different solution to the problem is called for.
- RR-0742 Need ability to asynchronously stop another task
- RR-0768 Need to asynchronously interrupt another task to stop it
- AI-00450 Should allow raising of an exception in another task
A different solution is called for.

5.4 Asynchronous Communication

User Need U5.4-A: Asynchronous Message Passing

Requirement R5.4-A(1) — Non-Blocking Communication

This requirement deals with intertask communication within a single program. There is also a need for interprogram communication. That need is addressed under Requirement R8.1-A(1).

- RR-0183 Asynchronous inter-task communication is not available
- RR-0587 Provide for communication between loosely coupled tasks
- RR-0655 Add asynchronous message queues
- RR-0665C Support message-driven intertask communication
- RR-0748 Provide standard package of asynchronous primitives

User Need U5.4-B: Asynchronous Multicast

Study Topic S5.4-B(1) — Asynchronous Multicast

The need for this capability was established during reviews with real-time system developers. There was only one revision request that explicitly mentioned such a need.

- RR-0665A Support multicast message transfer

6 Requirements for System Programming

6.1 Unsigned Integer Operations

User Need U6.1-A: Unsigned Integers

Requirement R6.1-A(1) — Unsigned Integer Operations

The need to deal with unsigned integer representations and typical operations on such representations was mentioned in several revision requests.

RR-0136 Provide support for bit-field operations such as shift, rotate

RR-0138 Need full-sized unsigned integers

RR-0139 Provide shift and rotate operations for boolean arrays
The requirement supplies the requested functionality.

RR-0188 Embedded applications need unsigned integers and bit-wise logical operations on integer types

RR-0332 Provide unsigned integer capability

This RR provides a fairly extensive discussion of the need and the language design difficulties.

RR-0433 There is a need for predefined unsigned integer types

RR-0460 Ada needs to provide support for unsigned integer types

This RR provides an extensive discussion of the issues and a detailed solution that helps to indicate the full range of the requirement.

RR-0633 Provide logical operations (e.g., XOR) for integers

RR-0634 Provide arithmetic shift operations for integers

RR-0640 Need to access chunk of a bit vector as a whole

The requirement provides much of the requested functionality.

RR-0721 Try to add unsigned integers to the language

RR-0766 Allow bit-wise operations (AND, SHIFT) on integers, bytes, etc

AI-00600 Why we need unsigned integers in Ada

6.2 Data Interoperability

User Need U6.2-A: Data Interoperability

Requirement R6.2-A(1) — Data Interoperability

Two requests are concerned with the ability to control how data is blocked for efficient transmission. The first (RR-0103B) is concerned with breaking up a large data structure into smaller blocks to reduce I/O buffer size, and the second (RR-0773) is concerned with grouping several variable length records into a single block for efficient data transmission.

RR-0017 Be able to treat an Ada object as an array of storage units

This RR gives an extensive example and discussion of difficulties in writing I/O packages for arbitrary data types.

RR-0103B Provide efficient means of reading large data structures in chunks

This problem could also be solved by providing an appropriate FORM parameter when opening a file, so a large data structure would be read or written in several blocks, thereby using smaller internal buffers.

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- RR-0289 Need multiple views of a record structure even when no discriminant is present
Unchecked conversion is not the answer to this problem, since UC can't be used as the target in an assignment and copying is too inefficient.
- RR-0417 Length clause should force allocation of EXACT number of bits
The interpretation of length clauses is actively under review by the ARG. In particular, see AI-00536, AI-00553, AI-00561, and AI-00825.
- RR-0626 Files produced by SEQUENTIAL_IO and DIRECT_IO are not portable among computers, even for the same target machine e.g., because of dope vectors
- RR-0773 Need to pack variable-length records into a block for data transmission

6.3 Interrupts

User Need U6.3-A: Interrupt Handling

Requirement R6.3-A(1) — Interrupt Servicing

Several user requests relevant to this section noted that Ada was over-restrictive in requiring that interrupt priorities be uniformly higher than user-defined task priorities. Others simply asked for more efficient and natural ways to deal with interrupts.

- RR-0087 Allow software priorities to match/exceed hardware priorities
- RR-0115 Provide better interrupt handling model
This RR contains a good discussion of current problems in dealing with interrupts.
- RR-0151 Need standard support for priority interrupts
- RR-0179 The treatment of interrupts is too implementation-dependent
Several problems are discussed in detail in this RR.
- RR-0286D Interrupts should be handled with a procedure model, not a task model
- RR-0316 Improve interrupt handling, e.g., with interrupt procedures
- RR-0421A Need to delay in processing an interrupt
- RR-0421D The treatment of interrupts as ordinary, timed, or conditional calls may depend inappropriately on the run-time system
The point here is that the run-time system may insulate the application program too completely from hardware-dependent behavior, and so different implementations may behave differently even for the same target hardware.
- RR-0686 Priority of interrupts higher than normal tasks is ill-conceived

Requirement R6.3-A(2) — Interrupt Binding

Revision requests relevant to this section dealt with various aspects of Ada's model for associating interrupts with code to be executed when an interrupt occurs.

- RR-0114 Allow an address clause for each task instance, and not just on the type
Meeting this requirement should solve the problem underlying this RR.
- RR-0195 Need interrupt address per task, not task type
Meeting this requirement should solve the problem underlying this RR.
- RR-0349 Interrupt addresses and memory addresses are conceptually different and should not be treated the same by the language
This RR presents what is believed to be a potential problem, but does not give any specific example of a difficulty imposed by the current approach.
- RR-0421B Interrupt address structure is sometimes different from memory address structure; a single type for both is inappropriate
No specific examples of problems are given.

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- RR-0421C Need to associate interrupts with entries of task objects, not task types
- RR-0710 Need to tie task entries to asynchronous external events generated by operating system
- RR-0735 Need ability to change interrupt bindings at run-time

6.4 Dynamic References to Global Objects

User Need U6.4-A: Dynamic Access to Global Objects

Requirement R6.4-A(1) — Access Values Designating Global Objects

The concern here was primarily the ability to get access to special memory locations and to data structures that may have been initialized outside the program.

- RR-0018 Need pre-elaborated constant arrays with variable-sized elements
This RR gives a careful and extensive discussion of the stated need.
- RR-0110 Provide explicit control over placement of and access to data in different types or regions of memory
- RR-0238 Allow access values to designate read-only memory
- RR-0258 Need access values that point to declared objects
The purpose behind this request is to be able to establish static data structures linked by pointers.
- RR-0291 Clarify whether use of an address clause causes storage to be initialized
- RR-0293 Allow access values to point to declared objects
No examples are given.
- RR-0338 Provide pointers to static objects and safe conversion between ADDRESS values and access values
Examples include large data structures such as maps residing in ROM. The use of unchecked conversion is too implementation-dependent and unsafe because addresses and access values do not necessarily have the same representation.
- RR-0524 Allow functions to return references to components of objects; allow programmer to ensure pass by reference for any object
- RR-0726 Need non-contiguous arrays, static pointers
The requirement supplies much of the requested functionality.
- AJ-00874 Ensure that access values are values of 'ADDRESS

User Need U6.4-B: Low-Level Manipulation of Access Values

Study Topic S6.4-B(1) — Low-Level Pointer Operations

One RR gave a specific example of the reason these capabilities are needed.

- RR-0450 Need efficient manipulation of buffers whose type is determined at run time
The RR gives an example of a use of the capabilities called for in the requirement.

6: Requirements for System Programming

7 Requirements for Parallel Processing

7.1 Shared Memory

User Need U7.1-A: Control of Shared Memory

Requirement R7.1-A(1) — Control of Shared Memory

Deficiencies in Ada's treatment of shared memory were mentioned by several revision requests.

RR-0062 Ensure memory mapped devices are treated correctly by compilers

RR-0119 Need synchronized reference to elements of shared composite objects

This RR provides a good discussion of some problems concerning the use of memory locations shared among tasks, e.g., memory-mapped I/O and guarding against optimizations that remove references to volatile memory locations.

RR-0434 Need atomic read/write operations on shared volatile memory

RR-0678 Pragma SHARED is not sufficient for data shared between programs; need VOLATILE

AI-00142 Allow pragma SHARED to be applied to components of composite objects

7.2 Massively Parallel Architectures

User Need U7.2-A: Large Numbers of Tasks

Study Topic S7.2-A(1) — Managing Large Numbers of Tasks

The revision requests primarily address the need to initialize tasks and to give tasks unique identities.

RR-0123 Provide initialization values to tasks at startup

This RR provides an extensive discussion and examples illustrating the problem and a possible solution.

RR-0133 Allow a task component of an array to get its index

This RR explicitly cites an example for a massively parallel architecture.

RR-0334 Need to specify task parameters giving a task its work domain, e.g., to process part of an array

RR-0380 Need a task identifier for every task

The RR gives a lengthy discussion of possible uses of task identifiers.

7.3 Vector Architectures

User Need U7.3-A: Support for Vector Architectures

Study Topic S7.3-A(1) — Statement Level Parallelism

Revision requests for these capabilities come from users who are interested in computationally intensive numerical analysis.

RR-0514 Provide support for simple parallel threads within a program unit

Some of the requested functionality is included in the requirement.

RR-0738 Add facilities to support vector processing hardware

Although the requirement does not suggest that vector types and operands be added to the language, it does require that the revision address the needs of vector processing hardware.

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RR-0741 Need hot performance on vector machines; add vector types and operands

7.4 Configuration of Parallel Programs

User Need U7.4-A: Configuration of Parallel Programs

Study Topic S7.4-A(1) — Configuration of Parallel Programs

There were no revision requests addressing this study topic, which arose from discussions with experts in the use of massively parallel systems. The ability to control the placement of tasks is, however, of interest in distributed systems as well (see Requirement R8.2-A(1)).

8 Requirements for Distributed Processing

8.1 Distribution of Ada Applications

User Need U8.1-A: Distributing an Application

Requirement R8.1-A(1) — Facilitating Software Distribution

This requirement deals with adjusting Ada semantics to allow for the possibility of distributed execution. It is stated as a Requirement rather than as a Study Topic because it is expected that only small changes are needed and because proposals for standard interprogram communication packages already exist.

RR-0109 Provide Ada semantics that are helpful when dealing with a single distributed Ada program
The request for distribution across heterogeneous processors is not met. This RR, however, gives a good discussion of some of the key problems that make use of Ada 83 more difficult than necessary for distributed processing.

RR-0111 Provide explicit support for fault tolerance and recovery
This is covered by item 2 of the Requirement.

RR-0182 Define visibility limits for parts of a program running on different processors

RR-0728 Need simple Ada run-time system for distributed memory MIMD architectures
This RR asks for simplifications that reduce the size of the runtime system that must be supported on each node of a distributed system. No specific suggestions are made.

There were several requests for a standard interprogram communication package. Such a need is mentioned in the discussion of the requirement.

RR-0181 Need standard means of communicating between Ada programs

RR-0222 Need additional predefined packages for process control/communication

RR-0224 Add communication support required for distributed systems

RR-0378 Need standard means of communication in distributed system

RR-0480 Need standard means of sending messages between Ada programs

8.2 Dynamic Reconfiguration of Distributed Systems

User Need U8.2-A: Configuring an Ada Application

Requirement R8.2-A(1) — Dynamic Reconfiguration

This requirement is not classified as a Study Topic because it was felt that only small changes are needed to allow for the possibility of static or dynamic configuration of programs. In particular, ensuring that elaboration of declarations takes place only when necessary is an important part of this requirement. Such control is also useful for non-distributed applications.

RR-0370A Can't recover space declared in library units when reconfiguring a system

RR-0370B Can't restart library level tasks

RR-0373 Need to be able to dynamically alter a program as it is running

RR-0377 Ada should allow partitioning of programs for multiple processor environments

RR-0661 Need language features for assigning tasks to nodes

RR-0665B Support allocation of parallel processes to processors

RR-0723 Need support for reconfiguration in emergency cases

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The following requests concern pre-elaboration; they also are met by Requirement R8.2-A(1) since the ability to avoid elaboration is essential during reconfiguration.

RR-0117 Provide pre-elaboratable constructs

This RR presents a set of possible rules defining units that can be pre-elaborated.

RR-0243 Allow/require elaboration prior to run time

RR-J244A Require pre-elaboration of some constructs

RR-0245 Change Standard to encourage pre-elaboration

RR-0246 Ensure that constant declarations are not elaborated at run time when initialized with static expressions

The problem addressed here is pre-elaboration, although the proposed solution is too drastic.

RR-0285 Minimize the need for run-time elaboration

RR-0639 Need compile-time initialization of complex data structures

This problem may be better solved with a separate CASE tool.

RR-0653 Need to declare constants whose value is supplied after linking

9 Requirements for Safety-Critical and Trusted Applications

9.1 Predictability of Execution

User Need U9.1-A: Constraining the Possible Meanings of a Program

Study Topic S9.1-A(1) — Determining Implementation Choices

This Study Topic asks that when freedom is given to implementations, the implementation should provide a way of controlling or at least document the choices that have been made. This Study Topic complements Requirement R2.4-A(1), which deals with reducing implementation dependences.

RR-0143 Document implementation dependences

RR-0176 Document run-time system performance and memory allocation strategies

RR-0644 Standard should specify time bounds/constraints for certain operations

This RR provides some possibly helpful examples of performance constraints that might be imposed in an Ada 9X annex.

Requirement R9.1-A(2) — Ensuring Canonical Application of Operations

The ability to ensure a compiler does not remove seemingly redundant checks is important in safety-critical applications.

RR-0254 Too much freedom is allowed with respect to exceptions and intermediate expression results

RR-0386 Need standard way of telling the compiler not to optimize

RR-0554 Need constraint checks for target of `Unchecked_Conversion` and I/O input

Section 11.6 of Standard allows seemingly redundant constraint checks to be optimized away.

RR-0718 Need predictable results in numeric computation, especially regarding optimization

This RR gives an example of how optimization might cause difficulty in evaluating carefully constructed numerical expressions.

RR-0729 Language should provide way to turn off optimization to eliminate bugs

9.2 Certifiability

User Need U9.2-A: Validation of Generated Code

Requirement R9.2-A(1) — Generating Easily Checked Code

This requirement was developed as a result of meetings with experts in the safety-critical and trusted systems community. No revision requests were submitted that are directly relevant to the requirement.

9.3 Enforcement of Safety-Critical Programming Practices

User Need U9.3-A: Restricting the Use of Ada Features

Requirement R9.3-A(1) — Allow Additional Compile-Time Restrictions

Solutions to this requirement are of general utility, but since the requirement is particularly important to safety-critical and trusted systems, it was placed in this chapter. The revision requests

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suggest various restrictions that might be allowed by a capability proposed in response to the stated requirement.

RR-0216 Require that each task entry have at least one accept statement

Requiring at least one accept statement for each entry may be a reasonable project coding convention that should be enforceable by compilers.

RR-0325A Allow implementations to enforce local coding standards

RR-0328 Require compilers to report questionable uses of the language

This RR does not list any specific questionable uses.

RR-0435 Need secondary standard for simple Ada subset for safety-critical applications

The requirement does not propose that Ada 9X will provide such a standard, but it does allow an independently-developed standard to be enforced.

RR-0517 Provide syntax to declare program units free from side-effects

It is not clear that the benefits are worth the costs in language complexity and compiler checks.

RR-0538 Create new loop structure which bans the EXIT statement

A pragma could be used to forbid use of the exit statement.

RR-0771 Require tasks to have an accept for each entry

Requiring at least one accept statement for each entry may be a reasonable project coding convention that should be enforceable by compilers.

10 Requirements for Information Systems

10.1 Handling Currency Quantities for Information Systems

User Need U10.1-A: Support for Currency Quantities

Requirement R10.1-A(1) — Decimal-Based Types

This requirement was based on input from the information systems community in meetings with the Requirements Team.

Study Topic S10.1-A(2) — Specification of Decimal Representation

There was only one revision request directly related to the requirement.

RR-0357 Need packed decimal, wide-ranging fixed-point, decimal deltas

10.2 Compatibility with Other Character Sets

User Need U10.2-A: Alternate Character Set Support

Study Topic S10.2-A(1) — Alternate Character Set Support

AI-00216 Provide standard methods for testing whether characters are numeric, upper case, lower case, control, etc., independent of character representation

This AI requests that such tests be specifiable in a uniform manner, regardless of the representation for a character set.

10.3 Interfacing with Data Base Systems

User Need U10.3-A: Interfacing Ada Programs to DBMSs

Study Topic S10.3-A(1) — Interfacing with Data Base Systems

Interaction with DBMS's is increasingly common in building information systems. The requirement reflects this trend.

10.4 Common Functions

User Need U10.4-A: Standard Data Manipulation

Study Topic S10.4-A(1) — Varying-Length String Package

There were several revision requests asking for standard facilities in support of varying length strings.

RR-0051B Provide standard string manipulation packages

RR-0163 Need support for variable-length strings with appropriate equality and assignment operations

RR-0310 Need convenient way to pad with blanks in string assignments

A varying-length string library might obviate the need for this functionality.

RR-0327 Add varying length strings to the language

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RR-0419 Add some form of support for varying length strings to the language

Study Topic S10.4-A(2) — String Manipulation Functions

String editing functionality was requested several times.

RR-0051C Provide packages for string edit functions

RR-0324 Add more flexible support for string manipulation

The RR suggests incorporating string manipulation operations that are supported in ICON, PL/I, and REXX.

RR-0360 Add picture-formatting capabilities to TEXT_IO

The requirement does not go this far, but does suggest adding picture-formatting functions in a separate package.

11 Requirements for Scientific and Mathematical Applications

11.1 Floating Point

User Need U11.1-A: Common Mathematical Functions

Requirement R11.1-A(1) — Standard Mathematics Packages

Two standard packages are currently under development by numeric working groups. One package deals with primitive functions useful in developing numeric algorithms; the other specifies standard elementary functions. Both packages could be included in Ada 9X either directly or by reference. Two revision requests asked for functionality that is not included in either of these packages.

RR-0308 Add libraries for array processing

RR-0536 Provide MIN and MAX numeric operators

The following requests ask for primitive functions useful in developing numeric algorithms. These functions are being provided in the Generic Primitive Functions package currently being considered for ISO standardization.

RR-0024 Need a way to decompose floating point numbers into mantissa/exponent

RR-0102 Provide explicit remainder operator for real numbers

RR-0255 Provide a function for returning the value of the next floating point number

RR-0346 Need portable way to extract mantissa/exponent from floating point number

RR-0358 Need support for floor, ceiling, truncate, and whole operations

RR-0453 Provide a special function or attribute yielding the sign of a numeric value

RR-0454 Need Entier function or attribute for real types

RR-0535 Provide CEILING and FLOOR numeric operators

RR-0645 Need mantissa/exponent extraction and manipulation

RR-0716 Unify and add attributes for numeric types

Many of the requested functions are being provided in packages currently being considered for ISO standardization.

These requests ask for standard functions such as trigonometric functions, logarithms, square root, etc. These functions are being provided in the Generic Elementary Functions package currently being considered for ISO standardization.

RR-0051A Provide common mathematics packages

RR-0189 Standard should include a floating-point math library interface

RR-0348 Need predefined functions for real numbers, e.g., trig, log, etc

RR-0719 Need standard for trig functions, sqrt, etc

User Need U11.1-B: Floating Point Support

Study Topic S11.1-B(1) — Floating Point Facilities

The requirement here is to foster predictable use of floating point on a variety of architectures. Given the differences in architectures, this implies providing a set of functions that allow algorithms to be adapted to the idiosyncrasies of particular architectures. The following revision requests reflect the difficulties in using the current floating point model predictably.

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- RR-0225 Ensure floating point representation with desired accuracy is used
- RR-0252A Ensure support for IEEE floating point standard; allow full use of machine characteristics
- RR-0252B Programmer needs to know/control whether rounding or truncation is used in real calculations
- RR-0252C Ensure programmer can choose appropriate floating point representation
- RR-0252E Provide a floating point model that reflects actual machine architecture
- RR-0369 Provide support for floating point standard IEEE-754
- RR-0492 Decouple mantissa and exponent information in floating point type definitions
- RR-0564 Allow implementation freedom to include more mantissa digits in floating point safe numbers
- RR-0636 Improve Ada's axioms for floating point operations
- RR-0637 Ada programs should run as though negative zero did not exist
This is a complex issue that is being considered by the Numerics Rapporteur Group of ISO-IEC/JTC1/SC22/WG9.
- RR-0720 Floating-point model should reflect actual hardware architectures
- RR-0731 Use the Language Compatible Arithmetic Standard as a basis for Ada's floating point model
- AI-00609 Floating point machine attributes inadequate to fully characterize machine characteristics

11.2 Representation of Arrays

User Need U11.2-A: Ordering of Array Components in Memory

Study Topic S11.2-A(1) — Array Representation

The RRs here are concerned primarily with interfacing with libraries of FORTRAN subroutines.

- RR-0039 Make it easier to access FORTRAN libraries
This RR discusses quite extensively the problems of interfacing Ada with FORTRAN numerics subroutines.
- RR-0507 Provide information/control over row-major or column-major ordering
The RR gives a detailed discussion of the inefficiency caused by Ada rules.

12 Efficiency, Simplicity, and Consistency Issues

This chapter corresponds to Appendix A of the Requirements Document. Section 2.2 of that document calls for general improvements to the language by reducing deterrents to efficiency, modifying rules that have proven to be confusing or error-prone to users, and minimizing special case restrictions.

Only some of the RRs relevant to the requirements in Section 2.2 were reflected in Appendix A of the Requirements Document. Additional topics that should be considered by the Mapping/Revision Team are listed in Section 2.2 above.

12.1 Efficiency of Executed Code

12.1.1 Access to a Task Outside its Master (see RD A.1.1)

These RRs point out the cost in execution efficiency caused by allowing a task to be accessed from outside of its master.

- RR-0104 Prohibit access to a task outside its master
- RR-0194 Disallow referencing a task from outside its master
- RR-0427 Do not permit a function to return a locally-declared task object
- AI-00570 Releasing heap storage associated with task type instances
Implementations would find it easier to return unused storage if tasks could not exist outside their masters.

12.1.2 Null Ranges (see RD A.1.2)

These RRs point out problems with null ranges.

- RR-0234 "Sub-null" ranges are of little value and an implementation burden
- RR-0249 'First and 'last for null ranges are defined oddly
This RR gives a specific example of a problem.
- RR-0250 Define clearer notation for expressing null ranges

12.2 Understandability

Appendix Section A.2 of the Requirements Document lists some language rules that have proven to be confusing or error-prone to users and that therefore should be considered for revision.

12.2.1 Elaboration Order (see RD A.2.1)

These RRs point out problems with controlling elaboration order, particularly in large applications where programmers do not have access to all the code that must be elaborated.

- RR-0004 Pragma ELABORATE should be transitive
- RR-0218 Make the implementation find a good library-unit elaboration order
The problem is relevant to a revision of pragma ELABORATE.
- RR-0233 Pragma ELABORATE should be transitive
- RR-0396 Add library unit elaboration ordering rules to reduce need for pragma ELABORATE

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RR-0546 It is too difficult to ensure that pragma ELABORATE is used when it is needed

This RR gives some examples of problems involving pragma ELABORATE.

RR-0581A Eliminate need for pragma ELABORATE; pragma NOT_ELABORATE might help

This RR contains some detailed discussion and examples.

RR-0581 Rules specifying the position of pragma ELABORATE are error-prone and unhelpful

RR-0767 Solve the elaboration order problem without requiring the use of pragma ELABORATE

AI-00421 Eliminate pragma ELABORATE

This AI explains the dangers in the current definition of pragma ELABORATE.

12.2.2 Later Declarative Items (see RD A.2.2)

These RRs point out the confusion that arises from the restriction that certain forms of declaration are not allowed after a body has been declared.

RR-0032 Allow grouping of variable declarations and related subprograms

RR-0428 Order of declarations is too restrictive

Specific anomalies mentioned are the inability to specify an address clause immediately after an entry declaration and the inability to specify a representation clause after a body has been declared.

RR-0569 Relax rules separating basic from later declarative items

RR-0594 Relax rules separating basic from later declarative items

12.2.3 Visibility of Literals and Operations (see RD A.2.3)

Quite a few revision requests asked that Ada 9X provide a way to make the operators of a type directly visible without writing a use clause.

RR-0022 Need direct visibility of operators declared in another package

RR-0057 Need direct visibility to infix operators in another package

RR-0096A Permit renaming an enumeration literal as a character literal

RR-0232 Need to allow direct visibility of operators in packages

RR-0239A Renaming an enumeration type should make literals visible

RR-0393 Can't get direct visibility of fixed point mult and div operator by renaming

RR-0429 Need construct that makes just overloadable declarations directly visible

RR-0467 Need convenient way to rename a type and get its operations

RR-0474 Need direct visibility to just enumeration literals and operators of a type

RR-0555 Need "selective" USE clause to get just operators and subprograms of a type

RR-0624 Provide selective direct visibility into a package

The requirement addresses some of the request.

RR-0652 Declaring a subtype should make the equality operator directly visible

RR-0694 Need easy direct visibility to the equality operations

RR-0727 Need selective direct visibility of package declarations

The requirement reflects some of the requested functionality.

AI-00378 Enumeration literals should be made directly visible by a subtype declaration

AI-00390 Character literals should be made directly visible by a subtype declaration

AI-00480 Operators should be made directly visible by a subtype declaration

12.2.4 Obsolete Optional Bodies (see RD A.2.4)

The rules dealing with optional package bodies can cause subtle program errors.

RR-0426A The effect of an optional package body is confusing to users

RR-0689 Optional bodies should not be unlinked without a warning

12.2.5 OTHERS Choice in Aggregates (see RD A.2.5)

The rules restricting the use of an OTHERS choice have proven to be confusing to programmers.

RR-0029 Allow use of OTHERS with named associations when the index constraint is determined by context

RR-0571A Allow use of OTHERS choice with named associations when index bounds are determined by context

RR-0605 Rules for OTHERS in aggregates are confusing

12.3 Generality

Appendix Section A.3 of the Requirements Document lists some examples of existing capabilities that could be generalized in natural ways.

12.3.1 IMAGE and VALUE for Real Types (see RD A.3.1)

There were two requests for generalizing the use of the IMAGE and VALUE attributes.

RR-0363 Allow 'VALUE and 'IMAGE to apply to real types as well as discrete types

RR-0664 Need 'IMAGE and 'VALUE attributes for floating-point types

12.3.2 Exception Handlers in Accept Statements (see RD A.3.2)

One revision request pointed out this seeming inconsistency in the language.

RR-0499 Like other "blocks", allow exception handlers in accept statements

12.3.3 RANGE Attribute for Scalar Types (see RD A.3.3)

The RANGE attribute was not defined for scalar types because in many cases, the subtype name itself suffices. For example:

```
type ARR is array ARR_TYPE (SCALAR_SUBTYPE) of INTEGER;
```

It is not necessary to write:

```
type ARR is array ARR_TYPE (SCALAR_SUBTYPE' RANGE) of INTEGER;
```

Nonetheless, from a consistency viewpoint, users expect to be able to use the RANGE attribute in this situation.

RR-0155 Define RANGE attribute for scalar types

RR-0304 Define RANGE attribute for scalar types

RR-0623 Define RANGE attribute for discrete ranges

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12.3.4 Permit "raise ... when <condition>" (see RD A.3.4)

For many programmers, it would seem consistent to be able to use a when clause on return and raise statements as well as on exit statements.

- RR-0132 Allow optional WHEN <condition> on RAISE statement for consistency with EXIT statement
- RR-0141 Allow WHEN <condition> on RAISE statements
- RR-0200 Allow optional when_clause on RAISE and RETURN statements
- RR-0362 Allow optional when_clause on the raise statement
- RR-0614 Allow WHEN condition RETURN to make selection of returned value clearer
- RR-0751 Add WHEN/RAISE construct to the language

12.3.5 STORAGE_SIZE for Task Objects (see RD A.3.5)

Several requests noted the need to specify the storage size for individual task objects rather than just on task types.

- RR-0464 Should be able to set STORAGE_SIZE for task objects as well as types
- RR-0648 Need to set STORAGE_SIZE on task objects, not task types
- RR-0703 Need to specify STORAGE_SIZE on task objects, not task types
- AI-00453 STORAGE_SIZE for tasks

12.3.6 Explicit Type Conversions in Static Expressions (see RD A.3.6)

An Ada comment, which led to the current rule, is reproduced in Appendix C.

- RR-0009 Allow static conversion to static discrete type of static discrete expression
It might be worthwhile to go even further to allow general static scalar conversions, despite the problem of INTEGER(1.5). See Ada Comment 4709, which is reproduced here as Appendix C.1 on page 102.
- RR-0099 Explicit type conversions should be allowed in static expressions
The RR gives an example of a problem caused by the current rules.

12.3.7 Use of a Subprogram Name in its Specification (see RD A.3.7)

RR-0675 points out the seeming inconsistency in the following example that stems from the restriction in section 8.3(16).

```
with TEXT_IO;
package USER is
  function MODE(FILE : TEXT_IO.FILE_TYPE) return TEXT_IO.MODE; -- illegal
  function NAME(FILE : TEXT_IO.FILE_TYPE) return STRING
    renames TEXT_IO.NAME; -- legal
end USER;
```

- RR-0462 Allow selected component form of type mark in a formal part even when the selected component has the same identifier as the subprogram
- RR-0483 Allow an instantiated subprogram to have the same identifier as the generic unit (as is allowed for package instances)
- RR-0579 Allow a type mark of form P.FOO in the formal part of a subprogram named FOO
- RR-0675 Allow a subprogram identifier to be used as a type mark in its specification

12.3.8 Default Names for Generic Formal Parameters (see RD A.3.8)

The following RR provides a good example of the problem.

RR-0714 Allow default names for all generic formal parameters

The RR gives a detailed example showing the problem caused by the inability to associate default names with generic formal types.

12.3.9 Ability to Redefine “=” (see RD A.3.9)

Several RRs noted that it would be useful to allow the straightforward declaration of the equality operator for all types.

RR-0008 Allow overloading of the equality operator for all types

RR-0025 Allow overloading of the equality operator with different operand types

RR-0412 Allow overloaded = for all types, not just limited types

RR-0513 Allow overloading of = for any type, e.g., returning an array type

As the RR points out, there is no strong reason to limit the result type of the equality operators.

12.3.10 Reading OUT Parameters (see RD A.3.10)

RR-0002 points out a problem with the current restriction on reading out parameters — since programmers assign results to a local surrogate for the out parameter, they can easily forget the final assignment from the surrogate to the formal out parameter before returning from a procedure.

RR-0002 Allow reading of OUT parameters

RR-0303 Allow reading of OUT parameters

RR-0539 Allow reading of OUT parameters

AI-00478 Allow reading of OUT formal parameters

This AI points out that if a formal out parameter is used as an actual out parameter in a call, it is quite natural to want to read the returned value before returning from a call.

AI-00479 Initialize access type OUT parameters to null

This AI is essentially the same as RR-0559.

12.3.11 Implicit Subtype Conversions (see RD A.3.11)

Many programmers are caught by surprise when no implicit subtype conversion is allowed for array aggregates in certain contexts.

RR-0240 Non-sliding aggregates and slices in component associations

The RR points out inconsistencies between assignment and component association.

RR-0573 Slide indices of array aggregates for record component initialization and as components of record aggregates

RR-0734 Generalize cases that allow implicit subtype conversion

RR-0749 Should allow index sliding for slices serving as actual parameters and as values in record components

12.3.12 Negative Literals in Loops (see RD A.3.12)

The Ada comment that led to the current rule is reproduced in Appendix C.2 on page 103.

RR-0156 A negative literal should be allowed wherever a literal is allowed

AI-00140 Allow -1..10 as a discrete range in loops

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12.3.13 Naming Syntactic Items (see RD A.3.13)

Several RRs suggested that the ability to name constructs should be extended to more than just blocks and program units.

- RR-0199 Allow IF, CASE, and SELECT constructs to be named
- RR-0205 Allow program unit name on PRIVATE, BEGIN, and EXCEPTION
- RR-0340 Allow optional simple name on CASE, IF, and SELECT statements
- RR-0596 Allow END type_name to substitute for END RECORD
- RR-0673 Allow "END RECORD type_name" to substitute for "END RECORD")

12.4 Usability of Ada

Appendix Section A.4 of the Requirements Document lists some areas in which changes to Ada will make it easier to use.

12.4.1 Completion of Subprogram Declarations (see RD A.4.1)

The ability to complete subprogram declarations with a renaming declaration or a generic instantiation was often requested.

- RR-0075 Allow a subprogram body to be defined by renaming or generic instantiation
- RR-0096B Allow a procedure body to be provided by a renaming declaration
- RR-0157 Allow renaming when defining a subprogram body
This RR gives examples showing the usefulness of the proposed capability.
- RR-0231 Allow a rename definition of a subprogram body
Examples of inadequate workarounds are given.
- RR-0364 Allow a subprogram body to be defined by generic instantiation
An example is given using an instantiation of UNCHECKED_CONVERSION.
- RR-0470 Allow renaming or generic instantiation to define a subprogram body
Reasonable examples are given.
- RR-0550 Allow subprogram bodies to be defined by RENAMES or generic instantiation
- RR-0666 Allow a subprogram body to be given by generic instantiation
- RR-0667 Allow a subprogram body to be given by RENAMES
- RR-0725 Need rename in package body for routine in package specification
- RR-0764 Allow subprogram bodies to be defined by RENAMES
This RR argues that the workaround needed when a subprogram body can't be provided by a renaming declaration increases recompilation requirements.

12.4.2 Completing Incomplete and Private Types by Subtype Declarations (see RD A.4.2)

The ability to use a subtype declaration to provide the full declaration of a private type was proposed in several revision requests.

- RR-0096C Allow the full declaration of a private type to be provided by a renaming declaration
- RR-0690 Allow incomplete and private types to be completed by subtype declaration
- AI-00540 Completing a private type declaration with a subtype declaration

13 Requests Rejected

Rejected requests are listed in this chapter. Except for the first set of RRs, they are grouped by reason for rejection.

13.1 Requests Rejected: Various Reasons

Each request listed in this section is accompanied by a short description of its reason for rejection.

- RR-0146 Support for file/record locking
This is too specialized a capability to require for every implementation.
- RR-0147 Add support for ISAM
Although an ISAM package might be useful, there are too many other higher priority requirements that should be addressed.
- RR-0153 Private part foils separation of specification and implementation
Much of the requested functionality can be obtained by completing an incomplete type in a package body.
- RR-0154 Subunits should not have to be at the outermost compilation unit level
The ability to declare a subunit in a nested block would require extra complications in requiring that all enclosing blocks be named. Allowing subunit declarations in nested units but not in blocks would seem to be a non-uniformity, so there is no easy way to provide the requested capability.
- RR-0162 Provide a clean interface to a SORT package
Providing attributes for use with a standard interface to a sort package would be useful in information system applications, but other changes were judged to have higher priority.
- RR-0214 Require that a subprogram parameter be used within the body
Such a change would be an inconvenience during program development.
- RR-0217 Require that a parameter of an entry be used within an accept
Such a change would be an inconvenience during program development.
- RR-0248 Allow users to specify locations for discriminants that are outside record values
The RR does not provide sufficient justification for allowing non-local record discriminants.
- RR-0253 DIGITS and DELTA approach leads to inefficiency, non-portability
This RR does not reflect a correct understanding of the efficiency impacts of DIGITS and DELTA specifications.
- RR-0256 Fixed-point approach with range and delta is not what is needed
Fixed point representations can be completely controlled in Ada 83 with proper use of 'SMALL and 'SIZE representation clauses.
- RR-0263 CONSTRAINT_ERROR is too broadly defined
This issue was given thorough consideration in the original design. Insufficient evidence is given in this RR to justify reconsidering the decision.
- RR-0277 Inappropriate wording
The wording (in 8.6(1), not 8.8(1) as in the RR) is acceptable. For 9(5) the comment refers to a note, which is worded acceptably.
- RR-0299 Make everything in the Standard "part of the standard"
Many readers find the extra material useful.
- RR-0322 Do not add any new reserved words to the language
This matter will be resolved by the Mapping/Revision Team, and there is no direction in the Requirements Document. Note, however, that the magnitude of the requirements is such that it is not likely to be practical to meet this request. See also the Upward Compatibility guideline on page 5 of the Requirements Document.

13: Requests Rejected

- RR-0329 Using a deferred constant before it has a value
The apparent problem raised by this request does not exist. The example given in the RR is illegal by 7.4.1(3).
- RR-0339 Support sorting in extended alphabets
There does not appear to be any solution at the language level. See the discussion following Requirement R3.1-A(1).
- RR-0345 Need standardized interface to other ANSI languages
Since interfaces to other programming languages depend on both the language and the implementation, it isn't clear that anything useful can be done to solve the RR's problem in Ada 9X, despite the example solutions given in the RR.
- RR-0399 Break up overly broad predefined exceptions, e.g., `CONSTRAINT_ERROR`
This issue was given thorough consideration in the original design, and insufficient evidence is given in this RR to justify reconsidering the decision.
- RR-0425 Need open ranges in declarations of real subtypes
There is no obvious notation, and the change is of marginal benefit.
- RR-0449 Do not allow unchecked conversion of private types
Unchecked conversion exists as an escape mechanism whose usage should not be restricted by the language. Local controls on its use could be enforced in response to Requirement R9.3-A(1).
- RR-0478 Add language facilities for restricting use of resources to trusted packages
Providing special-purposes pragmas for such purposes is beyond the scope of the revision effort.
- RR-0479 Need standard subprograms to get user-interface information from OS
This is not a bad idea, but there are more important issues that deserve attention.
- RR-0518 Provide syntax to declare subprogram pre/post conditions
The desired checks can be written in the existing language in a way that permits the optimizer to take advantage of the checks.
- RR-0519 Simplify overload rules for ambiguous/universal expressions
These issues were considered thoroughly in the original design, and it is unlikely that the rules can be improved in general without introducing other anomalies. Of course, the -1..10 case (Section A.3.12) should be fixed, but this is not an overloading resolution anomaly but rather a special case rule.
- RR-0520 Language should distinguish "sequence" and "mapping" arrays
It is far from clear that adding a new type would create a simpler, less easily misused language.
- RR-0545 Subunits should not have to be at the outermost compilation unit level
The ability to declare a subunit in a nested block would require extra complications in requiring that all enclosing blocks be named. Allowing subunit declarations in nested units but not in blocks would seem to be a non-uniformity, so there is no easy way to provide the requested capability.
- RR-0570 Allow the prefix of a name to denote a renaming of an enclosing construct
AI-00119 discusses the reasons for this restriction.
- RR-0572 Need predefined operators with respect to all predefined integer types
The change would require revision of the overloading rules because $X**2$ would become ambiguous.
- RR-0607 Allow names of compilation units to be overloadable, operator symbols
Although it may seem more uniform to allow library unit names to be overloaded, a with clause naming such a unit would be unresolvably ambiguous.
- RR-0618 Ban GOTO statement
Tools that produce Ada code need to be able to generate GOTOs.
- RR-0638 Axioms for built-in operations should be specified explicitly
This was considered and rejected in the initial design as being unnecessary for clarity and precision. The current wording is adequate.

- RR-0680** Predefined exponentiation should take any integer type for exponent
This change is difficult to make because of the overload resolution rules. This problem was considered extensively in the initial design, and all solutions posed difficulties to users. There are more important changes to focus on in this revision of Ada.
- RR-0700** Ensure that constant functions like `sin(10.0)` are evaluated at compile-time
It is too difficult to define what functions should be evaluated at compile-time. Moreover, the change would pose the potentially severe implementation burden of requiring a target machine function to be evaluated in the host machine environment.
- RR-0765** Allow "when `Package_Name.others =>`" as exception handler
This change could introduce serious problems during maintenance.
- RR-0774D** Allow overloaded names in the library
Although it may seem more uniform to allow library unit names to be overloaded, a with clause naming such a unit would be unresolvably ambiguous.
- RR-0774I** Create separate standards, such as X-Windows, SQL
The creation of separate standards is outside the scope of the Ada 9X revision effort.
- RR-0774L** Allow pragma `INTERFACE` within a package body
The compiler needs this information before a package body is compiled in order to minimize the need for recompilation.
- RR-0774M** Allow a subprogram to be renamed in a body
Since a renaming declaration already is allowed in a body, the intent behind this request is unclear.
- AI-00003** Allow data of mode `IN` in `SEND_CONTROL`
There is no requirement to fix the low-level I/O programming capabilities in the language. Other needs are more important.
- AI-00274** Proposed extension of the `USE` clause — record component visibility
Introducing a Pascal-like use clause for records might be convenient, but it is not necessarily straightforward to ensure that all components of the record maintain their existence throughout the scope of the use clause. There are more important requirements to be addressed.
- AI-00460** Allow non-integral powers for exponentiation
This change is difficult to make because of the overload resolution rules. This problem was considered extensively in the initial design, and all solutions posed difficulties to users. There are more important changes to focus on in this revision of Ada.
- AI-00529** Resolving the meaning of an attribute name
The rules for resolving the overloading of an attribute prefix were adopted after considerable review of complex cases. The example given in this AI does not suggest that there is sufficient user need to reconsider this complicated area of the language.

13.1.1 Requests Rejected: Machine Code

These requests are for improvements in the machine code feature of Ada. They have been rejected because it is not considered worth the effort to make improvements to machine code procedures. Programmers can alternatively use direct interfaces to routines coded in assembly language.

- RR-0043** Make it easier and more portable to use assembler with Ada
- RR-0284** Machine-code insertions are unreadable; replace with `INLINE` macros
- RR-0371** Need more usable and portable machine code insertions
- RR-0489** Allow machine-code insertions in functions as well as procedures
- RR-0691** Allow machine-code insertions in functions as well as procedures

13: Requests Rejected

13.1.2 Requests Rejected: Exit from a Block

Although there were several requests for extending the permitted use of exit statements to allow an exit from a block, there are difficult language design problems associated with such an extension. In particular, when a block is nested in a loop, there is no convenient syntax to distinguish whether an exit statement is intended to exit from the block or from the loop.

- RR-0491 Code would be clearer if one could EXIT from a block statement
- RR-0632 Allow EXIT from a block statement for consistency
- RR-0695 Allow EXIT from block for legibility

13.2 Requests Rejected: An Opposing Requirement was Imposed

These requests were rejected because the Requirements Document states a contradictory requirement for reasons stated in the document.

- RR-0044 There is no need to add unsigned integers to Ada
See User Need U6.1-A.
- RR-0054 Do not add variable length strings to the language
See Study Topic S10.4-A(1).
- RR-0071 Improve support for heterogeneous distributed processing
Dealing with heterogeneous distributed systems is beyond the scope of the revision (see Requirement R8.1-A(1)), but this RR discusses some of the issues that would have to be addressed otherwise.
- RR-0300 Use an LR grammar to define the syntax of the language
Requirement R2.1-B(1) discourages such changes.
- RR-0326 Use a different syntax production style
This RR suggests that the Ada syntax productions should provide more information about program legality and suggests that an attribute grammar should be used. This kind of stylistic change has been ruled out of scope by Requirement R2.1-B(1).
- RR-0372 Solve problem where heterogeneous processors view memory differently
Dealing with heterogeneous shared memory systems is beyond the scope of the requirements (see Requirement R8.1-A(1)).
- RR-0630 Due to high implementation costs, define/allow Ada subsets
The Requirements Team explicitly considered and rejected the notion of allowing subsets as not being consistent with the goals of the revision effort. See Section 1.2 of the Requirements Document.
- RR-0646 Allow exceptions to be parameterized with parameters read in handler
The requirements for exceptions are much less ambitious because of potential implementation overhead.

13.3 Requests Rejected: Insufficient Information in the Request

The text of these requests provided insufficient information to permit the Requirements Team to evaluate them properly. In many cases the request states that a problem exists without explaining just what the problem is and what needs to be done about it.

- RR-0012 Mutation of types is needed for AI applications
It isn't clear what capability is being requested.
- RR-0080 Derived types are clumsy
The RR states that there are problems but does not identify them.

- RR-0144 Require support for fixed point arithmetic even if floating point hardware is not present
It is not clear what language change, if any, is being requested.
- RR-0158 Allow multi-way conditional and timed entry calls
- RR-0166 Allow definition of the literal representations of an abstract data type
- RR-0173 Allow a rendezvous with a higher-level entity, i.e., a set of tasks
- RR-0186 It is difficult to write an entire operating system in Ada
The request asks for additional ways to refer to a task and to control it, but gives no examples of what deficiencies are to be remedied or what additional control is thought to be needed.
- RR-0264 Discriminants need to stand out more
- RR-0282 Ada program structure hides important context information
- RR-0333 More precise definition of TEXT_IO is needed, less implementation freedom.
The RR says that there are problems but does not identify them.
- RR-0376 Need special treatment of exceptions in distributed/parallel/multi-processor systems
The RR is very short and does not clearly indicate what problem needs to be solved.
- RR-0394 Merge concepts of task and package into concept of an object
Insufficient motivation is given for the requested change.
- RR-0530 Insufficient support for mutants of limited types
- RR-0608 Allow recursive generic instantiations
It is not clear how this could be implemented.
- RR-0612 Should allow both delay and terminate alternatives in selective wait
The intended semantics is not clear.
- RR-0699 Do not treat an unaccepted length clause for a type as an error
- RR-0704 Make every bit available to the application programmer
- RR-0759 Add real-time and verification facilities for control engineering
- AI-00521 Fixed point subtypes should not inherit SMALL
The submitted comment does not give enough motivation for the suggested change to understand why a change might be useful.

13.4 Requests Rejected: Insufficient User Benefit

For these requests, it was judged that the item provided insufficient user benefit to justify disturbing the language even though the idea itself may be reasonable — not all reasonable ideas have sufficient benefit to justify incorporation in the revised language.

- RR-0028 Add a semicolon terminator to SEPARATE statement syntax
Allowing an optional semicolon would not avoid confusion and requiring a semicolon would not be upward compatible or of much benefit.
- RR-0049 Allow special notation when the same name is on both sides of :=
- RR-0053 Allow aggregates for null records and arrays
The RR points out that a null array aggregate can't be written if the component type is a private type for which no values are directly available. Nonetheless, it doesn't seem worthwhile to invent new notation just for these special cases.
- RR-0077 Provide stream I/O for digital signal processing
The need for stream I/O to support digital signal processing is too narrow for motivating a change, given the intended scope of the Ada 9X revision.
- RR-0086 Need to initialize a record component to the address of the record itself

13: Requests Rejected

- RR-0093 Allow full declaration of deferred constants to be given in a package body
Although the ability to defer the initialization of a constant to the body of a package would reduce the need for recompilation and although the RR proposes reasonable syntax, it is not clear that there is much demand for this change, and it would make new kinds of user errors possible (namely, accessing an uninitialized constant value).
- RR-0095 Allow applicable units to be named in USE clauses and pragma ELABORATE
- RR-0097 Allow/require explicit action to get default parameter value
- RR-0098 Generalize incomplete typing for types other than access or private
The limitation mentioned here may be satisfied by changes made under Study Topic S4.3-B(1).
- RR-0100 Allow constants to use default values to get value
- RR-0126 Allow underscore before "E" in exponents
- RR-0127 Allow real number output in non-decimal bases
- RR-0131 In a qualified expression, should have visibility of the enumeration literals of the qualifying type
- RR-0135 Catenation should not raise CONSTRAINT_ERROR for intermediate results
- RR-0169 Allow "null" procedures for actual or default generic formal subprogram values
This problem is discussed in more detail in the Ada 9X report, "Ada Support for Software Reuse" [6].
- RR-0198 Allow positional aggregate for single-component aggregate
- RR-0208 Need ability to initiate TEXT_IO, DIRECT_IO, and SEQ_IO operations without waiting for completion
The need for high level asynchronous I/O is not sufficiently great to warrant a change to implementations.
- RR-0221 Need to write common code for group of exception handlers
- RR-0229 Need to hide the range of a scalar type and the initial value of an object to ensure these values are not used directly by programmers
- RR-0270 Allow specification of read-only data from a package
- RR-0297 LOW_LEVEL_IO was a bad idea; remove this package from the language
- RR-0313 Allow deferred constants of arbitrary (i.e., non-private) types
- RR-0321 Permit anonymous array and record declarations for record components
- RR-0343 Provide better facilities for conditional compilation
- RR-0356 Need a way to get the compilation date and time within a program
This problem can be solved with a suitable environment tool.
- RR-0389 There is a need for "cyclic" discrete types in the language
- RR-0391 Clumsy syntax for based numbers, especially in aggregates
- RR-0426D Optional index in 'FIRST (and others) causes problems
- RR-0444 Let the user limit the places where a given exception can be raised
- RR-0452 Allow constant functions in static expressions (or overloadable constants)
The RR gives no examples showing why such functions are needed in contexts where the language requires static expressions (e.g., in the choice of a case statement).
- RR-0463 'Size is unclear; perhaps need 'Spacing and 'Allocation
- RR-0469 Parameter names for language-defined pragmas should be defined
- RR-0504 Add an exchange operator
- RR-0548 Allow convenient syntax for instantiating a nested generic unit
- RR-0552 Need "padded" line input with truncation and pad-fill to 'LENGTH
- RR-0558 Deriver of type should be able to hide subset of derived operations
The ability to hide some derived operations would add more complexity to the language than is acceptable to most users.

- RR-0576 Allow parameter default expressions to make use of previous IN parameters
This request is harder to satisfy than may appear at first, since it requires, in effect, that actual parameters be evaluated in an order dictated by the order of the formal parameters and is a potential complication for implementers without strong benefit to users.
- RR-0588C Allow a pragma ELABORATE for a subunit to mention a package name given in the context clause of a parent library unit
- RR-0588 Provide a form of USE clause that hides outer homographs
- RR-0621C Allow case statements to dispatch on value of an exception
The intent here is to call a procedure in an "others" handler with the actual exception as a parameter. A case statement in the procedure body dispatches on the actual exception value. This is an interesting idea, but not of sufficient value to fall under one of the stated requirements.
- RR-0635 Provide basic support for extended precision integer arithmetic
- RR-0642 Add label variables to support use of finite state machines
- RR-0672 Need anonymous pointer .types
- RR-0679 Allow component selection on objects of a private type
- RR-0696 Pragmas LIST and PAGE should be optional
- RR-0701 Allow specification of STANDARD in the same way as for SYSTEM
- RR-0730 The private part of a package should have its own context clause
Study Topic S4.3-B(1) may help to alleviate this problem.
- AI-00211 Additional control statement to hop to end of the loop
- AI-00442 Time zone information in package CALENDAR
It is not clear that time zone information is of sufficient general use to warrant a change to the language.
- AI-00518 Fixed and floating type declarations needlessly different
- AI-00538 Declaring constant arrays with an anonymous type
- AI-00582 Need a standard name for null address
- AI-00584 Restrict argument of RANGE attribute in Ada 9x
The example motivating the change is only one of several ways to write implementation-dependent programs and does not justify the proposed language change.
- AI-00681 Can't declare a constant of a NULL record type

13.4.1 User-Defined Attributes

These requests ask for the ability to declare user-defined attributes. They were rejected as not seeming to provide enough user benefit to justify disturbing the language.

- RR-0406 Allow user-defined attributes for user-defined types
- RR-0509 Allow user-defined attributes for user-defined or private types
- RR-0613 User-defined attributes solve portability problems with implementation-defined attributes
- RR-0674 Allow user-defined attributes as functions

13.4.2 Multidimensional Slices

These requests all concern multidimensional slices; they were rejected as not providing enough user benefit to justify disturbing the language.

- RR-0323 Generalize slice for multidimensional arrays
- RR-0494 Allow slices for any dimension in multidimensional arrays
- RR-0508 Allow slices for any dimension in multidimensional arrays

13: Requests Rejected

13.4.3 Permit Functions to have Parameter Modes IN OUT and OUT

These requests are that function parameters not be restricted to having only mode in. This change is too great to be accepted by users, as evidenced by the comments received when it was proposed in a draft version of the Ada 9X Requirements.

RR-0026 Permit function parameters to have modes IN OUT and OUT

RR-0598 Permit function parameters to have modes OUT and IN OUT

13.4.4 Anonymous Arrays

Several requests asked for the ability to use anonymous array declarations more widely in the language, particularly as record components.

RR-0336 Allow array type definitions in records; nice for array-of-array case

LSN-222 discusses the potential complexity of allowing this capability. See Language Study Notes, 1983, available from the Ada Information Clearinghouse.

RR-0443 Need for anonymous array types as record components

LSN-222 discusses the potential complexity of allowing this capability. See Language Study Notes, 1983, available from the Ada Information Clearinghouse.

AI-00429 Allow array type definition for record component

LSN-222 discusses the potential complexity of allowing this capability. See Language Study Notes, 1983, available from the Ada Information Clearinghouse.

13.5 Requests Rejected: Too Much Implementor Change for the Payoff

These requests were rejected as requiring too much change by implementors to justify the expected payoff.

RR-0288 Integrate representation clause information with declarations

RR-0290 The syntax used in record representation clauses is hard to read

RR-0312 Generalize case statement to decision table

RR-0320 Generalize case statement for other types, including REAL

RR-0392 Need "semi-limited" type with predefined := but no predefined =

RR-0473 Allow "partially" constrained subtypes of discriminated records

RR-0529 Allow selection of operations based on run-time queries about properties of types

A fully general ability to query type descriptors at run-time is requested here.

RR-0708 Allow infix function calls

RR-0733 Need fixed-point types not centered on zero

13.5.1 User-Defined Operators

Two revision requests asked for syntactic extensions to Ada by allowing user-defined operator symbols. Such a change would pose parsing difficulties that outweigh the potential user benefits.

RR-0201A Liberalize overloading of operators to other character sequences

RR-0682 Allow user-defined overloaded operators such as "?", ":-", etc

13.5.2 Non-static Objects as Case Labels

These requests, for use of non-static objects as choices in case statements, were rejected as requiring too much change by implementors to justify the expected payoff.

- RR-0561 Allow case statement to operate on strings for string processing
- RR-0650 Allow non-static case statement choices, non-discrete case statement expression
- AI-00477 Case choices should not have to be static

13.5.3 Discontiguous Subtypes

These requests ask for the ability to deal with discontiguous subtypes of enumeration types. This change was judged as requiring too much change by the implementors to justify the expected user benefit.

Several of these request a way to distinguish some elements of a discrete type from others. A constant array of booleans subscripted by the type provides an efficient solution to this problem.

- RR-0031 Provide a way to test for a value in a non-contiguous set
- RR-0046 Allow testing in discontiguous ranges and create true sets
- RR-0058 Allow discontiguous subtypes of enumeration types
- RR-0437 Provide "supertype" capability for merging enumeration types
- RR-0603 Allow discontiguous subtypes of discrete types

13.5.4 Overload Names of Generic Units

These requests are for the ability to overload the names of generic units. This change was judged as requiring too much change by implementors to justify the expected user benefit.

- RR-0035 Allow generic units to be overloaded
- RR-0606 Allow generic subprogram names to be overloaded

13.6 Requests Rejected: Not Sufficiently Compatible with Ada 83

These requests were rejected because they either required too great a change from Ada 83 or the necessary change was not sufficiently upward compatible (in terms of Guideline G-2).

- RR-0011 Expression $0^{**}0$ should not be 1 as this is an indeterminate form
No change could be upward compatible.
- RR-0030 Require subprogram specification to list non-local objects referred to
- RR-0079 TERMINATE alternative adds little value and is rarely used
- RR-0134 Require re-evaluation of entry count on abandoned entries
It is not clear that this would be easy or efficient to implement reliably due to race conditions.
Once evaluation of a select statement has begun, no entry calls could be abandoned until one alternative has been selected.
- RR-0152 Allow e.g., $a < b < c$ which would mean $a < b$ AND $b < c$
The RR proposes the new idea of n-ary operators.
- RR-0197 For access types, parameter mode IN should mean the designated object cannot be modified
- RR-0212 Allow assignment to record discriminant like other components
- RR-0247 Don't initialize access variables by default to NULL
- RR-0251 Invent new notations to distinguish function call, array reference, and conversions

13: Requests Rejected

- RR-0266 Operator overloading is dangerous
- RR-0268 Separation of specification and body is not worth it
- RR-0269 Make subprograms not recursive by default
This is a substantive change to the language, not just a change to a note as implied by the RR.
- RR-0271 Distinguish storage classes for variables with key words like CONTROLLED or STATIC
- RR-0272 Limited types are of little true value
- RR-0273 There are problems with private types in the language
- RR-0325B Allow implementations to experiment with supersets
- RR-0366 Subtype natural should not include zero
This change would be dangerously non-upward compatible. Moreover, mathematicians disagree on this.
- RR-0397 Replace keyword PRAGMA with something capturing meaning better
- RR-0424 Allow names exported from an instance to be redefined during instantiation
- RR-0426C Omitting index constraint in constant arrays causes programmer errors
- RR-0471 Allow specification of parameter modes in subprogram calls for clarity
This feature was considered explicitly and rejected in the initial design.
- RR-0476 Allow user-written type-conversion functions with the same name as the target type
The proposal would require significant change to the visibility rules and the overload resolution model.
- RR-0495 Remove leading space in the result of the 'IMAGE attribute for integers
- RR-0537 Separate integer divide and floating divide as in Pascal
- RR-0559 If allow reading of OUT parameters, initialize OUT access to NULL
There is no particular advantage in initializing an out parameter to null rather than to the value of its actual parameter. Moreover, such a change would be inconsistent with the current rule for components of an access type.
- RR-0617 Eliminate anonymous array types
- RR-0620 Ban RETURN statement except inside functions
- RR-0625 Change EXIT/WHEN to WHEN/EXIT to parallel Ada IF and English
- RR-0670 Decouple = and /=; do not distinguish private from limited private
- RR-0747 Provide better support for "light-weight" parallelism (as in Linda)
Although the LINDA model may be attractive, such a change of concept is outside the scope of the 9X revision effort.
- RR-0753 Make syntax for task type declarations more consistent
- RR-0774B Tasking defined as a standard package of functions

Two requests, concerned with providing dimensional mathematics support in Ada, were also judged as requiring too great a change from Ada 83.

- RR-0354 Introduce dimensional mathematics into the language
- RR-0745 Add facilities for dimensional mathematics to the language

13.7 Requests Rejected: Not a Language Issue

These requests are not properly addressed by changes to the language definition but rather by CASE tools or secondary standards.

- RR-0150 Provide "chaining" of different programs to reduce memory requirements
- RR-0210 Need more pragmas for software maintenance to MIL standards

13: Requests Rejected

- RR-0259 Incomplete type declarations are dangerous and unnecessary
This request reflects an incorrect understanding of Ada.
- RR-0262 Do not require existence of subunit for body stubs
A CASE tool can provide the requested functionality.
- RR-0265 Allow implementations to short-circuit in general, forget AND THEN
This request reflects an incorrect understanding of Ada.
- RR-0314 Define minimum-quality error diagnostics in the standard
- RR-0351 Trusted systems require auto-scrubbing of memory when done with it
- RR-0375 Include formal memory protection/security
The ability to restrict access to pages of memory is too operation-system dependent to be a suitable language requirement.
- RR-0497 Presence of default discriminants for types used as generic actual can yield a surprising run-time error
The problem raised in this RR is really a problem of correctly using the language rather than a language problem, particularly since the proposed solution would allow a constrained access variable to inadvertently designate an incorrectly constrained object.
- RR-0681 A definition of an Ada Line Of Code (LOC) should be standardized
- RR-0746 Allow pictures/graphics as comments in source code
The environment should provide this functionality.
- RR-0770 Make aborting yourself cause instant completeness
It is arguable that 9.10(6) requires immediate completion of a task that aborts itself.
- AI-00427 Semi-constrained subtypes
This comment reflects a misunderstanding of the language.

13: Requests Rejected

References

1. *Ada 9X Project Requirements Workshop*. Office of the Under Secretary of Defense for Acquisition, Washington, D.C. 20301, June 1989.
2. *Ada Board's Recommended Ada 9X Strategy*. Office of the Under Secretary of Defense for Acquisition, Washington, D.C. 20301, 1988.
3. *Approved Ada Language Commentaries*. Published by Grebyn Corporation, Vienna, VA. See also the up-to-date files kept by the Ada Information Clearinghouse; these files are also available on the AJPO machine (ajpo.sei.cmu.edu).
4. *Reference Manual for the Ada Programming Language*. ANSI/MIL-STD-1815A-1983 edition, 1983.
5. Baker, T. "Timing Issues Working Group". *Ada Letters X*, 4 (Spring 1990), 119-135. Proceedings of the Third International Workshop on Real-Time Ada Issues.
6. Cohen, S. Ada Support for Software Reuse. Software Engineering Institute, October, 1990. Ada 9X Project Report.
7. Fowler, K. J. A Study of Implementation-Dependent Pragmas and Attributes in Ada. Software Engineering Institute, November, 1989. Ada 9X Project Report.
8. Quiggle, T. J. "Asynchronous Transfer of Control Working Group". *Ada Letters X*, 4 (Spring 1990), 15-24. Proceedings of the Third International Workshop on Real-Time Ada Issues.
9. *Ada 9X Requirements*. Office of the Under Secretary of Defense for Acquisition, Washington, D.C. 20301, 1990.
10. *Standard Generalized Markup Language (SGML)*. ISO 8879 edition, 1987.

Appendix A: Numerical Listing of RRs

Revision request numbers are underlined when they contain examples or discussion that may be especially helpful to the Mapping/Revision Team or when reviewing proposed changes to the language.

- RR-0001: *Limited types need assignment, constants.* This request is considered under Study Topic S4.2-A(2).
- RR-0002: *Allow reading of OUT parameters.* This request is considered under Section A.3.10.
- RR-0003: *Provide a compiler-independent finalization mechanism.* This request is considered under Study Topic S4.2-A(2). See the discussion following the Study Topic.
- RR-0004: *Pragma ELABORATE should be transitive.* This request is considered under Section A.2.1.
- RR-0005: *Exception declarations in generic packages make code sharing unnecessarily difficult.* This request is considered under Requirement R4.4-C(1).
- RR-0006: *Distinguish unconstrained/constrained generic formal types.* This request is considered under Study Topic S4.4-B(2).
- RR-0007: *Default representation for enumeration types should be specified.* This request is considered under Requirement R2.4-A(1). The representation for predefined type BOOLEAN should continue to be implementation-defined for efficiency reasons.
- RR-0008: *Allow overloading of the equality operator for all types.* This request is considered under Section A.3.9.
- RR-0009: *Allow static conversion to static discrete type of static discrete expression.* This request is considered under Section A.3.6. It might be worthwhile to go even further to allow general static scalar conversions, despite the problem of INTEGER(1.5). See Ada Comment 4709, which is reproduced here as Appendix C.1 on page 102.
- RR-0010: *Allow the full declaration of a private type with discriminants to be a derived type.* This request is considered under Requirement R2.2-C(1). See also RR-0423.
- RR-0011: *Expression 0**0 should not be 1 as this is an indeterminate form.* Rejected: too great a change from Ada 83. See Section 13.6. No change could be upward compatible.
- RR-0012: *Mutation of types is needed for AI applications.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. It isn't clear what capability is being requested.
- RR-0013: *Allow task activation to occur at a higher priority than task execution.* This request is considered under Requirement R2.1-A(1). This request appears to be met by AI-00288, which requires that a task's activation occur at either its activator's priority or at its normal priority, whichever is higher.
- RR-0014: *Need to call subprograms loaded in ROM.* This request is considered under Requirement R4.1-B(2). Ada 9X could ensure that pragma INTERFACE is usable to identify subprograms located in ROM.
- RR-0015: *Allow task priorities to control all queuing/select decisions.* This request is considered under Requirement R5.2-A(1).
- RR-0016: *Allow user-selectable task scheduling algorithms.* This request is considered under Requirement R5.2-A(1).
- RR-0017: *Be able to treat an Ada object as an array of storage units.* This request is considered under Requirement R6.2-A(1). This RR gives an extensive example and discussion of difficulties in writing I/O packages for arbitrary data types.
- RR-0018: *Need pre-elaborated constant arrays with variable-sized elements.* This request is considered under Requirement R6.4-A(1). This RR gives a careful and extensive discussion of the stated need.
- RR-0019: *Allow types to specify finalization procedures for safely controlling use of collections.* This request is considered under Study Topic S4.2-A(2).
- RR-0020: *Relative importance of functions may change during program execution, so priorities should be changeable.* This request is considered under Requirement R5.2-A(1).
- RR-0021: *Need priority inheritance for server tasks.* This request is considered under Requirement R5.2-A(1).
- RR-0022: *Need direct visibility of operators declared in another package.* This request is considered under Section A.2.3.
- RR-0023: *Require TERMINATE alternative to terminate library tasks.* This request is considered under Requirement R2.1-A(1). This is already addressed by AI-00399.
- RR-0024: *Need a way to decompose floating point numbers into mantissa/exponent.* This request is considered under Requirement R11.1-A(1).
- RR-0025: *Allow overloading of the equality operator with different operand types.* This request is considered under Section A.3.9.
- RR-0026: *Permit function parameters to have modes IN OUT and OUT.* Rejected: insufficient user benefit (OUT modes for functions). See Section 13.4.3.

- RR-0027: *Improve generics so a generic report generator could be written.* This request is considered under Study Topic S4.4-A(1).
- RR-0028: *Add a semicolon terminator to SEPARATE statement syntax.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. Allowing an optional semicolon would not avoid confusion and requiring a semicolon would not be upward compatible or of much benefit.
- RR-0029: *Allow use of OTHERS with named associations when the index constraint is determined by context.* This request is considered under Section A.2.5.
- RR-0030: *Require subprogram specification to list non-local objects referred to.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0031: *Provide a way to test for a value in a non-contiguous set.* Rejected: insufficient user benefit (discontiguous subtypes). See Section 13.5.3.
- RR-0032: *Allow grouping of variable declarations and related subprograms.* This request is considered under Section A.2.2.
- RR-0033
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0033A: *Need to find the name of a raised exception.* This request is considered under Requirement R4.5-A(1).
- RR-0033B: *Need to pass exceptions to subprograms and generic units.* This request is considered under Study Topic S4.4-A(1).
- RR-0034: *Ada should use ISO 8859/1-9 (8-bit) character set.* This request is considered under Requirement R3.1-A(1).
- RR-0035: *Allow generic units to be overloaded.* Rejected: insufficient user benefit (overloaded generic names). See Section 13.5.4.
- RR-0036: *Allow exceptions to be grouped under a single name by allowing exception subtypes.* Rejected: insufficient user benefit (grouping exceptions). See Section 4.5-A(1).
- RR-0037: *Allow tasks (i.e., delays) to execute using simulated time rather than a real-time clock.* This request is considered under Requirement R5.2-A(1). An application-controlled scheduling interface might allow tasks to execute in simulated time, although such a capability goes beyond the intent of the stated requirement.
- RR-0038: *Allow expanded instead of simple names of subunits to be distinct.* This request is considered under Study Topic S4.3-C(1).
- RR-0039: *Make it easier to access FORTRAN libraries.* This request is considered under Study Topic S11.2-A(1). This RR discusses quite extensively the problems of interfacing Ada with FORTRAN numerics subroutines.
- RR-0040: *Need a way to determine the internal coding of enumeration values.* This request makes a useful suggestion for improvement in the ability to determine the representation of enumeration values. See Section 2.2.14 of this document.
- RR-0041: *Allow overloaded subunits with respect to a common ancestor library unit.* This request is considered under Study Topic S4.3-C(1).
- RR-0042: *Clarify the meaning of incorrect-order dependence and its effects.* This request is considered under Requirement R2.3-A(2).
- RR-0043: *Make it easier and more portable to use assembler with Ada.* Rejected: not desirable to ease machine code insertion. See Section 13.1.1.
- RR-0044: *There is no need to add unsigned integers to Ada.* Rejected: a contradictory requirement was made. See Section 13.2. See User Need U6.1-A.
- RR-0045: *Allow/require extended precision for intermediate integer results.* This request is considered under Requirement R2.4-A(1). Extended precision is already allowed, but not required, by Ada; see 11.6(6) of the Standard.
- RR-0046: *Allow testing in discontinuous ranges and create true sets.* Rejected: insufficient user benefit (discontiguous subtypes). See Section 13.5.3.
- RR-0047: *Add TEXT_IO.GET functions.* This request is considered under Requirement R4.6-A(1). There might be some benefit in this suggestion to add value-returning subprograms to TEXT_IO given that a variable length string package is uniformly available.
- RR-0048: *Extend static expressions to include representation attributes of composite types.* This request makes a useful suggestion for improvement in the ability to use representation attributes. See Section 2.2.4 of this document. Although the request is phrased in terms of allowing generic formal types to be used in static expressions, the example mainly shows a need to ensure that certain representation attributes can be used in static expressions.
- RR-0049: *Allow special notation when the same name is on both sides of :=.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0050: *Provide multi-national and multi-byte characters.* This request is considered under Requirement R3.1-A(2).
- RR-0051
This RR concerns three topics, each of which is treated separately. They are now listed.
- RR-0051A: *Provide common mathematics packages.* This request is considered under Requirement R11.1-A(1).
- RR-0051B: *Provide standard string manipulation packages.* This request is considered under Study Topic S10.4-A(1).

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- RR-0051C: *Provide packages for string edit functions.* This request is considered under Study Topic S10.4-A(2).
- RR-0052: *Multiple derived types from same package do not give desired operations.* This request is considered under Study Topic S4.3-B(1). RR-0482 contains a better example and motivation.
- RR-0053: *Allow aggregates for null records and arrays.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. The RR points out that a null array aggregate can't be written if the component type is a private type for which no values are directly available. Nonetheless, it doesn't seem worthwhile to invent new notation just for these special cases.
- RR-0054: *Do not add variable length strings to the language.* Rejected: a contradictory requirement was made. See Section 13.2. See Study Topic S10.4-A(1).
- RR-0055: *Allow a subprogram body to be defined by renaming or generic instantiation.* This request is considered under Section A.4.1.
- RR-0056: *Do not remove task entry families.* This request was met.
- RR-0057: *Need direct visibility to infix operators in another package.* This request is considered under Section A.2.3.
- RR-0058: *Allow discontinuous subtypes of enumeration types.* Rejected: insufficient user benefit (discontinuous subtypes). See Section 13.5.3.
- RR-0059: *Need an attribute for returning a representation's underlying value.* This request makes a useful suggestion for improvement in the ability to determine the representation of enumeration values. See Section 2.2.14 of this document.
- RR-0060: *Allow inlining of subprograms from some but not all call sites.* This request makes a useful suggestion for improvement in controlling the effect of pragma INLINE. See Section 2.2.9 of this document.
- RR-0061: *Make Long_Float and Short_Float required types.* This request is considered under Requirement R2.4-A(1).
- RR-0062: *Ensure memory mapped devices are treated correctly by compilers.* This request is considered under Requirement R7.1-A(1).
- RR-0063: *Protect tasks from being aborted while performing critical functions.* This request is considered under Requirement R5.3-A(1). Although this request is phrased in terms of protecting a task from being aborted, the underlying need is met by the Ada 9X requirement.
- RR-0064: *Allow some form of subprogram callback.* This request is considered under Requirement R4.1-B(1).
- RR-0065: *To improve reuse possibilities, allow rep clauses and various pragmas to be separated from the compilation unit to which they apply.* This request is considered under Study Topic S4.3-B(1).
- RR-0066: *Reduce risks associated with erroneous execution/incorrect order dependences.* This request is considered under Requirement R2.3-A(2).
- RR-0067: *Clarify/define technical terms used.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. This RR provides some detailed comments that may be useful.
- RR-0068: *The Standard should explicitly acknowledge that I/O support is optional for embedded systems.* This request is considered under Requirement R2.4-A(1). Implementation-dependent support for I/O functionality, particularly for implementations targeted to embedded systems, needs more attention.
- RR-0069: *Allow subprograms and types to be added to a package without modifying the original package.* This request is considered under Study Topic S4.3-B(1).
- RR-0070: *Allow user-defined assignment for limited types.* This request is considered under Study Topic S4.2-A(2).
- RR-0071: *Improve support for heterogeneous distributed processing.* Rejected: a contradictory requirement was made. See Section 13.2. Dealing with heterogeneous distributed systems is beyond the scope of the revision (see Requirement R8.1-A(1)), but this RR discusses some of the issues that would have to be addressed otherwise.
- RR-0072: *Prioritized queues and priority inheritance are needed for real-time applications.* This request is considered under Requirement R5.2-A(1).
- RR-0073: *Allow visibility of names to be restricted within a program library.* This request is considered under Study Topic S4.3-C(1).
- RR-0074: *Define a standard run-time support environment interface.* This request is considered under Requirement R5.2-A(1).
- RR-0075: *Queue entries by task priority or FIFO based on application.* This request is considered under Requirement R5.2-A(1).
- RR-0076: *Allow selection of entry calls from entry queues and open alternatives based on priorities.* This request is considered under Requirement R5.2-A(1).
- RR-0077: *Provide stream I/O for digital signal processing.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. The need for stream I/O to support digital signal processing is too narrow for motivating a

- change, given the intended scope of the Ada 9X revision.
- RR-0078: *Ada tasking is too complex, inflexible and inefficient.* These matters are addressed in Chapter 5 of the Requirements Document.
- RR-0079: *TERMINATE alternative adds little value and is rarely used.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0080: *Derived types are clumsy.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. The RR states that there are problems but does not identify them.
- RR-0081: *Provide subprogram and package types.* This request is considered under Study Topic S4.1-A(1). Subprogram types is an obvious solution to this requirement. The RR is very short and provides no arguments explaining the need for package types.
- RR-0082: *Allow declaration of objects of private types in visible package specification.* This request makes a useful suggestion for improvement in the ability to use private types before their full declaration. See Section 2.2.5 of this document.
- RR-0083: *Provide asynchronous transfer of control via entry call/selective wait construct.* This request is considered under Requirement R5.3-A(1). The proposed solution is attractive.
- RR-0084: *Specify standard conventions for using tasks that permit high-performance implementations.* This request is considered under Requirement R5.2-A(2). The intention here is to specify, in a real-time annex, the restrictions on task usage that allow tasks used for mutual exclusion to be implemented with special efficiency.
- RR-0085: *Need to get the name of the current exception.* This request is considered under Requirement R4.5-A(1). This RR gives some valid reasons for accessing the name of an exception.
- RR-0086: *Need to initialize a record component to the address of the record itself.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0087: *Allow software priorities to match/exceed hardware priorities.* This request is considered under Requirement R6.3-A(1).
- RR-0088: *Problems associated with user-defined assignment.* This request is considered under Study Topic S4.2-A(2). This RR points out some problems to be addressed if user-defined assignment is added to the language.
- RR-0089: *Provide facilities for I/O screen operations.* Rejected: low-level control of screen positioning via special commands to a terminal is outside the intended scope of the I/O packages.. See Section 4.6-A(1). Although there is a requirement for improved interactive text I/O functions, this request goes too far by asking for a screen management package. Text I/O is only intended to provide common, basic functionality.
- RR-0090: *Allow some task entries to be visible, some not.* This request makes a useful suggestion for improvement in restricting the visibility of task entries. See Section 2.2.11 of this document.
- RR-0091: *Don't specify the compilation process in the Standard.* This request is considered under Study Topic S4.3-C(1).
- RR-0092: *Allow user-specified finalization.* This request is considered under Study Topic S4.2-A(2).
- RR-0093: *Allow full declaration of deferred constants to be given in a package body.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. Although the ability to defer the initialization of a constant to the body of a package would reduce the need for recompilation and although the RR proposes reasonable syntax, it is not clear that there is much demand for this change, and it would make new kinds of user errors possible (namely, accessing an uninitialized constant value).
- RR-0094: *Make the multiple declaration rules more complete and consistent.* This request is considered under Requirement R2.2-B(1).
- RR-0095: *Allow applicable units to be named in USE clauses and pragma ELABORATE.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0096
This RR concerns three topics, each of which is treated separately. They are now listed.
- RR-0096A: *Permit renaming an enumeration literal as a character literal.* This request is considered under Section A.2.3.
- RR-0096B: *Allow a procedure body to be provided by a renaming declaration.* This request is considered under Section A.4.1.
- RR-0096C: *Allow the full declaration of a private type to be provided by a renaming declaration.* This request is considered under Section A.4.2.
- RR-0097: *Allow/require explicit action to get default parameter value.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0098: *Generalize incomplete typing for types other than access or private.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. The limitation mentioned here may be satisfied by changes made under Study Topic S4.3-B(1).
- RR-0099: *Explicit type conversions should be allowed in static expressions.* This request is considered under Section A.3.6. The RR gives an example of a problem caused by the current rules.

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- RR-0100: *Allow constants to use default values to get value.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0101
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0101A: *Allow exceptions to be grouped under a single name.* Rejected: insufficient user benefit (grouping exceptions). See Section 4.5-A(1).
- RR-0101B: *Need to pass exceptions as parameters to generic units and subprograms.* This request is considered under Study Topic S4.4-A(1). Most of this RR deals with the ability to group exception names.
- RR-0102: *Provide explicit remainder operator for real numbers.* This request is considered under Requirement R11.1-A(1).
- RR-0103
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0103A: *Allow unchecked conversion for IN OUT and OUT parameters.* This request makes a useful suggestion for improvement in the treatment of subprogram parameters. See Section 2.2.3 of this document.
- RR-0103B: *Provide efficient means of reading large data structures in chunks.* This request is considered under Requirement R6.2-A(1). This problem could also be solved by providing an appropriate FORM parameter when opening a file, so a large data structure would be read or written in several blocks, thereby using smaller internal buffers.
- RR-0104: *Prohibit access to a task outside its master.* This request is considered under Section A.1.1.
- RR-0105: *Allow application to set/adjust clocks.* This request is considered under Requirement R5.1-A(1). The ability to adjust the elapsed time or time-of-day clocks is implicit in the stated requirement.
- RR-0106: *Provide asynchronous transfer of control.* This request is considered under Requirement R5.3-A(1). This RR contains a good rationale and good examples dealing with the need for asynchronous transfer of control.
- RR-0107: *Allow application to specify clock timing interval if hardware allows this flexibility.* This request is considered under Requirement R5.1-A(1).
- RR-0108: *Need to be able to wake up a task at a particular local time.* This request is considered under Requirement R5.1-B(1). Provides a good discussion of some of the issues.
- RR-0109: *Provide Ada semantics that are helpful when dealing with a single distributed Ada program.* This request is considered under Requirement R8.1-A(1). The request for distribution across heterogeneous processors is not met. This RR, however, gives a good discussion of some of the key problems that make use of Ada 83 more difficult than necessary for distributed processing.
- RR-0110: *Provide explicit control over placement of and access to data in different types or regions of memory.* This request is considered under Requirement R6.4-A(1).
- RR-0111: *Provide explicit support for fault tolerance and recovery.* This request is considered under Requirement R8.1-A(1). This is covered by item 2 of the Requirement.
- RR-0112: *Provide user support for controlled space reclamation.* This request is considered under Requirement R4.2-A(1). This RR provides an example user interface for controlling storage allocation and reclamation.
- RR-0113: *Ensure that there are no storage "leaks".* This request is considered under Requirement R4.2-A(1). This RR gives some examples of how storage leaks can occur.
- RR-0114: *Allow an address clause for each task instance, and not just on the type.* This request is considered under Requirement R6.3-A(2). Meeting this requirement should solve the problem underlying this RR.
- RR-0115: *Provide better interrupt handling model.* This request is considered under Requirement R6.3-A(1). This RR contains a good discussion of current problems in dealing with interrupts.
- RR-0116: *User-modifiable priorities needed for mode change and graceful degradation.* This request is considered under Requirement R5.2-A(1). This RR gives brief examples supporting the stated need.
- RR-0117: *Provide pre-elaboratable constructs.* This request is considered under Requirement R8.2-A(1). This RR presents a set of possible rules defining units that can be pre-elaborated.
- RR-0118: *Provide a user-specified storage reserve for STORAGE_ERROR recovery.* This request is considered under Requirement R4.2-A(1). This capability could be automatically made available if Ada 9X allowed user-defined storage management operations to be written.
- RR-0119: *Need synchronized reference to elements of shared composite objects.* This request is considered under Requirement R7.1-A(1). This RR provides a good discussion of some problems concerning the use of memory locations shared among tasks, e.g., memory-mapped I/O and guarding against optimizations that remove references to volatile memory locations.
- RR-0120: *Allow users to defer the signalling of STORAGE_ERROR when space is exhausted.* This request is considered under Requirement R4.2-A(1). The problem can be solved in its full generality only by customizing a storage allocator.

- RR-0121: *Provide more user control over scheduling decisions.* This request is considered under Requirement R5.2-A(1).
- RR-0122: *Permit an implementation to reject some integer types as array indexes.* This request is considered under Requirement R2.2-A(1).
- RR-0123: *Provide initialization values to tasks at startup.* This request is considered under Study Topic S7.2-A(1). This RR provides an extensive discussion and examples illustrating the problem and a possible solution.
- RR-0124: *Ensure that code dependent on task scheduling algorithms is portable.* This request is considered under Requirement R5.2-A(1). Although this RR discusses AI-00594, which is not an approved AI, the concern of the RR is reflected in its title. This concern has been addressed by the notion of a real-time Annex for Ada 9X, since one purpose of the annex is to improve the performance portability of code. In addition, the requirement for user-controlled scheduling algorithms makes portability more possible.
- RR-0125: *Introduce object-oriented inheritance into the language.* This request is considered under Study Topic S4.3-B(1).
- RR-0126: *Allow underscore before "E" in exponents.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0127: *Allow real number output in non-decimal bases.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0128: *Provide subprograms as parameters to subprograms and entries.* This request is considered under Requirement R4.1-B(1).
- RR-0129: *Allow default initialization to be specified for any non-limited type.* This request makes a useful suggestion for improvement in default initialization capabilities. See Section 2.2.2 of this document.
- RR-0130: *Replace DEFAULT xy variables in Chapter 14 by functions.* This request is considered under Requirement R4.6-B(1). RR-0484 proposes a better change.
- RR-0131: *In a qualified expression, should have visibility of the enumeration literals of the qualifying type.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0132: *Allow optional WHEN <condition> on RAISE statement for consistency with EXIT statement.* This request is considered under Section A.3.4.
- RR-0133: *Allow a task component of an array to get its index.* This request is considered under Study Topic S7.2-A(1). This RR explicitly cites an example for a massively parallel architecture.
- RR-0134: *Require re-evaluation of entry' count on abandoned entries.* Rejected: too great a change from Ada 83. See Section 13.6. It is not clear that this would be easy or efficient to implement reliably due to race conditions. Once evaluation of a select statement has begun, no entry calls could be abandoned until one alternative has been selected.
- RR-0135: *Catenation should not raise CONSTRAINT_ERROR for intermediate results.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0136: *Provide support for bit-field operations such as shift, rotate.* This request is considered under Requirement R6.1-A(1).
- RR-0137: *Standardize bit storage/order conventions.* This request is considered under Requirement R2.4-A(1).
- RR-0138: *Need full-sized unsigned integers.* This request is considered under Requirement R6.1-A(1).
- RR-0139: *Provide shift and rotate operations for boolean arrays.* This request is considered under Requirement R6.1-A(1). The requirement supplies the requested functionality.
- RR-0140: *Provide support for object-oriented programming.* This request is considered under Study Topic S4.3-B(1).
- RR-0141: *Allow WHEN <condition> on RAISE statements.* This request is considered under Section A.3.4.
- RR-0142: *Reduce cases where recompilation of subunits is needed.* This request is considered under Study Topic S4.3-A(1). This RR gives some examples of the kinds of program changes that should not force recompilation.
- RR-0143: *Document implementation dependences.* This request is considered under Study Topic S9.1-A(1).
- RR-0144: *Require support for fixed point arithmetic even if floating point hardware is not present.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. It is not clear what language change, if any, is being requested.
- RR-0145: *Provide a way to get exception name from WHEN OTHERS handlers.* This request is considered under Requirement R4.5-A(1). This RR references a POSIX requirement for the ability to print the name of an exception from within an OTHERS handler.
- RR-0146: *Support for file/record locking.* Rejected: This is too specialized a capability to require for every implementation. See Section 13.1.
- RR-0147: *Add support for ISAM.* Rejected: Although an ISAM package might be useful, there are too many other higher priority requirements that should be addressed. See Section 13.1.

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- RR-0148: *Provide support for extended and graphic characters (256 ASCII set).* This request is considered under Requirement R3.1-A(1).
- RR-0149: *Provide a keyboard input/output package.* This request is considered under Requirement R4.6-A(1).
- RR-0150: *Provide "chaining" of different programs to reduce memory requirements.* Rejected: not a language issue. See Section 13.7.
- RR-0151: *Need standard support for priority interrupts.* This request is considered under Requirement R6.3-A(1).
- RR-0152: *Allow e.g., $a < b < c$ which would mean $a < b$ AND $b < c$.* Rejected: too great a change from Ada 83. See Section 13.6. The RR proposes the new idea of n-ary operators.
- RR-0153: *Private part foils separation of specification and implementation.* Rejected: Much of the requested functionality can be obtained by completing an incomplete type in a package body. See Section 13.1.
- RR-0154: *Subunits should not have to be at the outermost compilation unit level.* Rejected: The ability to declare a subunit in a nested block would require extra complications in requiring that all enclosing blocks be named. Allowing subunit declarations in nested units but not in blocks would seem to be a non-uniformity, so there is no easy way to provide the requested capability. See Section 13.1.
- RR-0155: *Define RANGE attribute for scalar types.* This request is considered under Section A.3.3.
- RR-0156: *A negative literal should be allowed wherever a literal is allowed.* This request is considered under Section A.3.12.
- RR-0157: *Allow renaming when defining a subprogram body.* This request is considered under Section A.4.1. This RR gives examples showing the usefulness of the proposed capability.
- RR-0158: *Allow multi-way conditional and timed entry calls.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3.
- RR-0159: *Add standard package of general file system functions.* This request is considered under Requirement R4.6-B(1).
- RR-0160: *Allow user-defined assignment for limited types.* This request is considered under Study Topic S4.2-A(2).
- RR-0161: *Allow default initialization for any non-limited type.* This request makes a useful suggestion for improvement in default initialization capabilities. See Section 2.2.2 of this document.
- RR-0162: *Provide a clean interface to a SORT package.* Rejected: Providing attributes for use with a standard interface to a sort package would be useful in information system applications, but other changes were judged to have higher priority. See Section 13.1.
- RR-0163: *Need support for variable-length strings with appropriate equality and assignment operations.* This request is considered under Study Topic S10.4-A(1).
- RR-0164: *Provide multitasking terminal I/O in TEXT_IO.* This request is considered under Requirement R4.6-A(1).
- RR-0165: *Allow parameter constraint violations to be compile-time errors.* This request is considered under Study Topic S2.3-A(1).
- RR-0166: *Allow definition of the literal representations of an abstract data type.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3.
- RR-0167: *Allow classes of abstract data types.* This request is considered under Study Topic S4.3-B(1).
- RR-0168: *Allow implicitly-invoked finalization code for storage management.* This request is considered under Study Topic S4.2-A(2).
- RR-0169: *Allow "null" procedures for actual or default generic formal subprogram values.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. This problem is discussed in more detail in the Ada 9X report, "Ada Support for Software Reuse" [6].
- RR-0170: *Permit or provide alternate scheduling algorithms.* This request is considered under Requirement R5.2-A(1).
- RR-0171: *Allow target-dependent code (including rep clauses) to be separate from other code.* This request is considered under Study Topic S4.3-B(1).
- RR-0172: *Make import and export of types easier.* This request is considered under Study Topic S4.3-B(1).
- RR-0173: *Allow a rendezvous with a higher-level entity, i.e., a set of tasks.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3.
- RR-0174: *Allow packages to be generic with respect to concurrency protection.* This request is considered under Study Topic S4.3-B(1). This is a good example of a form of specialization that is often needed.
- RR-0175: *Define interface between compiler- and target-specific run-time system aspects.* This request is considered under Requirement R5.2-A(1). The possibility of a standardized RTS interface is discussed under this requirement.
- RR-0176: *Document run-time system performance and memory allocation strategies.* This request is considered under Study Topic S9.1-A(1).
- RR-0177: *Standardize interface between compiler and library for configuration management.* This request is considered under Study Topic S4.3-C(1).

- RR-0178: *Problems with name clashes with big program libraries.* This request is considered under Study Topic S4.3-C(1).
- RR-0179: *The treatment of interrupts is too implementation-dependent.* This request is considered under Requirement R6.3-A(1). Several problems are discussed in detail in this RR.
- RR-0180: *There is a need for procedures as parameters for X-Windows, etc.* This request is considered under Requirement R4.1-B(1).
- RR-0181: *Need standard means of communicating between Ada programs.* This request is considered under Requirement R8.1-A(1).
- RR-0182: *Define visibility limits for parts of a program running on different processors.* This request is considered under Requirement R8.1-A(1).
- RR-0183: *Asynchronous inter-task communication is not available.* This request is considered under Requirement R5.4-A(1).
- RR-0184: *Need user-defined assignment operator for limited private type.* This request is considered under Study Topic S4.2-A(2).
- RR-0185: *General Ada rendezvous is slow; semaphores would be better.* This request is considered under Requirement R5.2-A(2).
- RR-0186: *It is difficult to write an entire operating system in Ada.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. The request asks for additional ways to refer to a task and to control it, but gives no examples of what deficiencies are to be remedied or what additional control is thought to be needed.
- RR-0187: *Need to allow unsigned enumeration representation specifications.* This request is considered under Requirement R2.4-A(1). This RR suggests that the representation of enumeration values cannot be controlled adequately since the treatment of sign extension for negative literals is not adequately controlled by the standard. It is not clear that this complaint is justified, but it should be given consideration.
- RR-0188: *Embedded applications need unsigned integers and bit-wise logical operations on integer types.* This request is considered under Requirement R6.1-A(1).
- RR-0189: *Standard should include a floating-point math library interface.* This request is considered under Requirement R11.1-A(1).
- RR-0190: *Allow use of a base type within a generic unit.* This request is considered under Study Topic S4.4-A(1).
- RR-0191: *Fixed point model numbers should include the bounds of the type definition.* This request is considered under Requirement R2.2-B(1).
- RR-0192: *Need ability to change priorities during mode change and for graceful degradation.* This request is considered under Requirement R5.2-A(1).
- RR-0193: *Allow priority queues, priority inheritance, and prioritized treatment of open select alternatives.* This request is considered under Requirement R5.2-A(1).
- RR-0194: *Disallow referencing a task from outside its master.* This request is considered under Section A.1.1.
- RR-0195: *Need interrupt address per task, not task type.* This request is considered under Requirement R6.3-A(2). Meeting this requirement should solve the problem underlying this RR.
- RR-0196: *Endorsement of RR-0083.* This request is considered under Requirement R5.3-A(1). This RR endorses the solution suggested in RR-0083 and repeats some material found in [8].
- RR-0197: *For access types, parameter mode IN should mean the designated object cannot be modified.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0198: *Allow positional aggregate for single-component aggregate.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0199: *Allow IF, CASE, and SELECT constructs to be named.* This request is considered under Section A.3.13.
- RR-0200: *Allow optional when clause on RAISE and RETURN statements.* This request is considered under Section A.3.4.
- RR-0201
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0201A: *Liberalize overloading of operators to other character sequences.* Rejected: too much implementor change for the payoff (user-defined operator syntax). See Section 13.5.1.
- RR-0201B: *Overload the assignment operation.* This request is considered under Study Topic S4.2-A(2).
- RR-0202: *Relax parameter mode rules for limited types that have an assignment operation.* This request is considered under Study Topic S4.2-A(2). These problems will be addressed by allowing user-defined assignment for limited types.
- RR-0203: *Allow finalization code for packages and tasks.* This request is considered under Study Topic S4.2-A(2).
- RR-0204: *Clarify which fixed point operators are predefined.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. This RR proposes an improvement to the Standard's Appendix C.
- RR-0205: *Allow program unit name on PRIVATE, BEGIN, and EXCEPTION.* This request is considered under Section A.3.13.

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- RR-0206: *Paragraph numbers should be included in the cross references.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.
- RR-0207: *Add TEXT IO support with Exists function and Append procedure.* This request is considered under Requirement R4.6-B(1).
- RR-0208: *Need ability to initiate TEXT IO, DIRECT IO, and SEQ IO operations without waiting for completion.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. The need for high level asynchronous I/O is not sufficiently great to warrant a change to implementations.
- RR-0209: *Require the compiler to report certain trace-raised exceptions.* This request is considered under Study Topic S2.3-A(1).
- RR-0210: *Need more pragmas for software maintenance to MIL standards.* Rejected: not a language issue. See Section 13.7.
- RR-0211: *Require compilers to report unrecognized or incorrect pragmas.* This request is considered under Study Topic S2.3-A(1).
- RR-0212: *Allow assignment to record discriminant like other components.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0213: *Need to be able to find out if an implementation rounds up or down.* This request is considered under Requirement R2.4-A(1).
- RR-0214: *Require that a subprogram parameter be used within the body.* Rejected: Such a change would be an inconvenience during program development. See Section 13.1.
- RR-0215: *Clarify termination of tasks dependent on library packages.* This request is considered under Requirement R2.1-A(1). This problem is addressed by AI-00399.
- RR-0216: *Require that each task entry have at least one accept statement.* This request is considered under Requirement R9.3-A(1). Requiring at least one accept statement for each entry may be a reasonable project coding convention that should be enforceable by compilers.
- RR-0217: *Require that a parameter of an entry be used within an accept.* Rejected: Such a change would be an inconvenience during program development. See Section 13.1.
- RR-0218: *Make the implementation find a good library-unit elaboration order.* This request is considered under Section A.2.1. The problem is relevant to a revision of pragma ELABORATE.
- RR-0219: *Provide a way to get the name of the last raised exception, including an out-of-scope exception.* This request is considered under Requirement R4.5-A(1).
- RR-0220: *Need way to get the internal code associated with enumeration values.* This request makes a useful suggestion for improvement in the ability to determine the representation of enumeration values. See Section 2.2.14 of this document.
- RR-0221: *Need to write common code for group of exception handlers.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0222: *Need additional predefined packages for process control/communication.* This request is considered under Requirement R8.1-A(1).
- RR-0223: *Need to add inheritance to support object-oriented programming.* This request is considered under Study Topic S4.3-B(1).
- RR-0224: *Add communication support required for distributed systems.* This request is considered under Requirement R8.1-A(1).
- RR-0225: *Ensure floating point representation with desired accuracy is used.* This request is considered under Study Topic S11.1-B(1).
- RR-0226: *Need standardized support for improved library management capabilities.* This request is considered under Study Topic S4.3-C(1). Presents a reasonable discussion of library management needs.
- RR-0227: *Allow generic parameterization with static numeric quantities.* This request is considered under Study Topic S4.4-A(1).
- RR-0228: *Allow generic parameterization with exceptions.* This request is considered under Study Topic S4.4-A(1).
- RR-0229: *Need to hide the range of a scalar type and the initial value of an object to ensure these values are not used directly by programmers.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0230: *Allow initialization to be associated with any type definition.* This request makes a useful suggestion for improvement in default initialization capabilities. See Section 2.2.2 of this document.
- RR-0231: *Allow a rename definition of a subprogram body.* This request is considered under Section A.4.1. Examples of inadequate workarounds are given.
- RR-0232: *Need to allow direct visibility of operators in packages.* This request is considered under Section A.2.3.
- RR-0233: *Pragma ELABORATE should be transitive.* This request is considered under Section A.2.1.
- RR-0234: *"Sub-null" ranges are of little value and an implementation burden.* This request is considered under Section A.1.2.
- RR-0235: *Need support for interactive terminal input/output.* This request is considered under Requirement R4.6-A(1).
- RR-0236: *Reduce implementation-dependent behavior, or at least, ensure it is documented whenever possible.* This request is considered under Requirement R2.4-A(1).

- RR-0237: *Make separate compilation independent of a particular library model.* This request is considered under Study Topic S4.3-C(1).
- RR-0238: *Allow access values to designate read-only memory.* This request is considered under Requirement R6.4-A(1).
- RR-0239
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0239A: *Renaming an enumeration type should make literals visible.* This request is considered under Section A.2.3.
- RR-0239B: *A renamed type cannot be used in an actual parameter type conversion.* This request makes a useful suggestion for improvement in the treatment of subprogram parameters. See Section 2.2.3 of this document.
- RR-0240: *Non-sliding aggregates and slices in component associations.* This request is considered under Section A.3.11. The RR points out inconsistencies between assignment and component association.
- RR-0241: *Need easier and more efficient support for mutual exclusion.* This request is considered under Requirement R5.2-A(2).
- RR-0242: *Require compilation warnings for potential run-time errors.* This request is considered under Study Topic S2.3-A(1).
- RR-0243: *Allow/require elaboration prior to run time.* This request is considered under Requirement R8.2-A(1).
- RR-0244
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0244A: *Require pre-elaboration of some constructs.* This request is considered under Requirement R8.2-A(1).
- RR-0244B: *Flag run-time errors at compile-time when possible.* This request is considered under Study Topic S2.3-A(1).
- RR-0245: *Change Standard to encourage pre-elaboration.* This request is considered under Requirement R8.2-A(1).
- RR-0246: *Ensure that constant declarations are not elaborated at run time when initialized with static expressions.* This request is considered under Requirement R8.2-A(1). The problem addressed here is pre-elaboration, although, the proposed solution is too drastic.
- RR-0247: *Don't initialize access variables by default to NULL.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0248: *Allow users to specify locations for discriminants that are outside record values.* Rejected: The RR does not provide sufficient justification for allowing non-local record discriminants. See Section 13.1.
- RR-0249: *'First and 'last for null ranges are defined oddly.* This request is considered under Section A.1.2. This RR gives a specific example of a problem.
- RR-0250: *Define clearer notation for expressing null ranges.* This request is considered under Section A.1.2.
- RR-0251: *Invent new notations to distinguish function call, array reference, and conversions.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0252
This RR concerns five topics, each of which is treated separately. They are now listed.
- RR-0252A: *Ensure support for IEEE floating point standard; allow full use of machine characteristics.* This request is considered under Study Topic S11.1-B(1).
- RR-0252B: *Programmer needs to know/control whether rounding or truncation is used in real calculations.* This request is considered under Study Topic S11.1-B(1).
- RR-0252C: *Ensure programmer can choose appropriate floating point representation.* This request is considered under Study Topic S11.1-B(1).
- RR-0252D: *Fixed point type should include the bounds of the range definition.* This request is considered under Requirement R2.2-B(1).
- RR-0252E: *Provide a floating point model that reflects actual machine architecture.* This request is considered under Study Topic S11.1-B(1).
- RR-0253: *DIGITS and DELTA approach leads to inefficiency, non-portability.* Rejected: This RR does not reflect a correct understanding of the efficiency impacts of DIGITS and DELTA specifications. See Section 13.1.
- RR-0254: *Too much freedom is allowed with respect to exceptions and intermediate expression results.* This request is considered under Requirement R9.1-A(2).
- RR-0255: *Provide a function for returning the value of the next floating point number.* This request is considered under Requirement R11.1-A(1).
- RR-0256: *Fixed-point approach with range and delta is not what is needed.* Rejected: Fixed point representations can be completely controlled in Ada 83 with proper use of 'SMALL and 'SIZE representation clauses. See Section 13.1.
- RR-0257: *Ensure that BOOLEAN and BYTE arrays can be tightly packed.* This request is considered under Requirement R2.1-A(1). AI-00555, which has been approved by the Ada Rapporteur Group, specifies that arrays of boolean components must be packed with no gaps. AI-00556 addresses the problem of arrays of bytes, but has not yet been approved.
- RR-0258: *Need access values that point to declared objects.* This request is considered under Re-

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- quirement R6.4 A(1). The purpose behind this request is to be able to establish static data structures linked by pointers.
- RR-0259: *Incomplete type declarations are dangerous and unnecessary.* Rejected: not a language issue. See Section 13.7. This request reflects an incorrect understanding of Ada.
- RR-0260: *The Standard is unclear in various ways.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. The RR contains several useful suggestions. However, the submitter wants the Standard to be more tutorial, which is probably not possible in a document intended to serve as the specification for a language.
- RR-0261: *Need compile-time warnings for access before elaboration errors.* This request is considered under Study Topic S2.3-A(1).
- RR-0262: *Do not require existence of subunit for body stubs.* Rejected: not a language issue. See Section 13.7. A CASE tool can provide the requested functionality.
- RR-0263: *CONSTRAINT ERROR is too broadly defined.* Rejected: This issue was given thorough consideration in the original design. Insufficient evidence is given in this RR to justify reconsidering the decision. See Section 13.1.
- RR-0264: *Discriminants need to stand out more.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3.
- RR-0265: *Allow implementations to short-circuit in general, forget AND THEN.* Rejected: not a language issue. See Section 13.7. This request reflects an incorrect understanding of Ada.
- RR-0266: *Operator overloading is dangerous.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0267: *The Standard is confusing in distinguishing specifications and declarations.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. The submitter wants the Standard to be more tutorial.
- RR-0268: *Separation of specification and body is not worth it.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0269: *Make subprograms not recursive by default.* Rejected: too great a change from Ada 83. See Section 13.6. This is a substantive change to the language, not just a change to a note as implied by the RR.
- RR-0270: *Allow specification of read-only data from a package.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0271: *Distinguish storage classes for variables with key words like CONTROLLED or STATIC.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0272: *Limited types are of little true value.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0273: *There are problems with private types in the language.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0274: *The visibility rules could be explained more clearly.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. The submitter wants the Standard to be more tutorial.
- RR-0275: *Error-prone and counter-intuitive aspects of RENAMES.* This request is considered under Requirement R2.2-B(1).
- RR-0276: *Need user specified accuracy and precision control over timing.* This request is considered under Requirement R5.1-A(1).
- RR-0277: *Inappropriate wording.* Rejected: The wording (in 8.6(1), not 8.8(1) as in the RR) is acceptable. For 9(5) the comment refers to a note, which is worded acceptably. See Section 13.1.
- RR-0278: *Tasking model should support common scheduling disciplines more easily.* This request is considered under Requirement R5.2-A(2).
- RR-0279: *If tasks are not used, the run-time system and compiled code should not include code for tasking support.* This request is considered under Requirement R2.2-A(1).
- RR-0280: *Short delays are too inefficient; Calendar time unnecessary; timing performance must be documented.* This request is considered under Requirement R5.1-A(1). The general tenor of this request is that Ada's timing model is not appropriate for embedded real-time systems, but the purpose of the requirements is to ensure that the Ada 9X model indeed is appropriate.
- RR-0281: *Confusing treatment of term "delay statement".* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.
- RR-0282: *Ada program structure hides important context information.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3.
- RR-0283: *Need convenient way to set global compilation parameters.* This request is considered under Study Topic S4.3-C(1).
- RR-0284: *Machine-code insertions are unreadable; replace with INLINE macros.* Rejected: not desirable to ease machine code insertion. See Section 13.1.1.
- RR-0285: *Minimize the need for run-time elaboration.* This request is considered under Requirement R8.2-A(1).

RR-0286

This RR concerns four topics, each of which is treated separately. They are now listed.

RR-0286A: *Embedded system users need the ability to control timer utilities.* This request is considered under Requirement R5.2-A(1).

RR-0286B: *Embedded system user may need access to interrupts that are also used by the run-time system.* This request is considered under Requirement R5.2-A(1).

RR-0286C: *Run-time system should avoid entering privileged mode.* This request is considered under Requirement R5.2-A(1).

RR-0286D: *Interrupts should be handled with a procedure model, not a task model.* This request is considered under Requirement R6.3-A(1).

RR-0287: *Make access types point directly to designated object.* This request is considered under Requirement R2.4-A(1). In some implementations, access values point to dope vectors rather than the designated object. This causes unnecessary implementation-dependence when interfacing with other languages.

RR-0288: *Integrate representation clause information with declarations.* Rejected: too much implementor change for the payoff. See Section 13.5.

RR-0289: *Need multiple views of a record structure even when no discriminant is present.* This request is considered under Requirement R6.2-A(1). Unchecked conversion is not the answer to this problem, since UC can't be used as the target in an assignment and copying is too inefficient.

RR-0290: *The syntax used in record representation clauses is hard to read.* Rejected: too much implementor change for the payoff. See Section 13.5.

RR-0291: *Clarify whether use of an address clause causes storage to be initialized.* This request is considered under Requirement R6.4-A(1).

RR-0292: *Section 13.6 of the standard has no semantic content.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. The RR notes correctly that the section is, in essence, just a note and perhaps should be so titled.

RR-0293: *Allow access values to point to declared objects.* This request is considered under Requirement R6.4-A(1). No examples are given.

RR-0294: *I/O packages are not suitable for embedded applications; make Chapter 14 optional.* This request was met — I/O is already not required if it can't be supported by the target platform.

RR-0295: *Create TEXT IO.PUT LINE for types other than string (make like PUT).* This request is considered under Requirement R4.6-B(1).

The operations called for here arguably improve the uniformity and teachability of TEXT_IO, but might also be considered to clutter the definition.

RR-0296: *Make predefined I/O packages optional if appropriate.* This request was met — I/O is not required if it is not appropriate for the platform.

RR-0297: *LOW_LEVEL_IO was a bad idea; remove this package from the language.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.

RR-0298: *Clarify classes of objects usable as attribute prefixes.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. The submitter wants the Standard to be more tutorial.

RR-0299: *Make everything in the Standard "part of the standard".* Rejected: Many readers find the extra material useful. See Section 13.1.

RR-0300: *Use an LR grammar to define the syntax of the language.* Rejected: a contradictory requirement was made. See Section 13.2. Requirement R2.1-B(1) discourages such changes.

RR-0301: *The wording concerning checking for consistency between compilations can be improved.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. The RR suggests a helpful rewording.

RR-0302: *The language should define literals for values of type ADDRESS.* This request is considered under Requirement R2.4-A(1).

RR-0303: *Allow reading of OUT parameters.* This request is considered under Section A.3.10.

RR-0304: *Define RANGE attribute for scalar types.* This request is considered under Section A.3.3.

RR-0305: *Clarify wording of FOR loop completion.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.

RR-0306: *Need to be able to start processing at a particular time of day.* This request is considered under Requirement R5.1-B(1).

RR-0307: *Allow completion of private declarations to be in the package body.* This request is considered under Study Topic S4.3-A(1). The RR gives a reference to a paper justifying a conclusion that efficient code can be generated even if a private type's full declaration is given in a package body.

RR-0308: *Add libraries for array processing.* This request is considered under Requirement R11.1-A(1).

RR-0309: *Ensure all cross references are complete and correct.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.

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- RR-0310: *Need convenient way to pad with blanks in string assignments.* This request is considered under Study Topic S10.4-A(1). A varying-length string library might obviate the need for this functionality.
- RR-0311: *Generalize character set for 8-bit characters.* This request is considered under Requirement R3.1-A(1).
- RR-0312: *Generalize case statement to decision table.* Rejected: too much implementor change for the payoff. See Section 13.5.
- RR-0313: *Allow deferred constants of arbitrary (i.e., non-private) types.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0314: *Define minimum-quality error diagnostics in the standard.* Rejected: not a language issue. See Section 13.7.
- RR-0315: *Allow integer type names that indicate representation size, e.g., INTEGER_32, to improve portability.* This request is considered under Requirement R2.4-A(1). This RR also recommends that the standard state explicitly that the length of LONG_INTEGER not be less than the length of INTEGER, with similar constraints imposed on SHORT_INTEGER.
- RR-0316: *Improve interrupt handling, e.g., with interrupt procedures.* This request is considered under Requirement R6.3-A(1).
- RR-0317: *Augment Ada's looping: over reals, list items, etc.* This request makes a useful suggestion for improvement in iteration constructs. See Section 2.2.12 of this document.
- RR-0318: *Make a machine-readable version of the Standard available (with embedded mark-up).* This request is considered under Requirement R2.1-C(1).
- RR-0319: *Remove arbitrary language restrictions, improve orthogonality.* This request is considered under Requirement R2.2-C(1). The RR does not give any specific suggestions, but the general intent of the RR is consistent with the requirement for generality.
- RR-0320: *Generalize case statement for other types, including REAL.* Rejected: too much implementor change for the payoff. See Section 13.5.
- RR-0321: *Permit anonymous array and record declarations for record components.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0322: *Do not add any new reserved words to the language.* Rejected: This matter will be resolved by the Mapping/Revision Team, and there is no direction in the Requirements Document. Note, however, that the magnitude of the requirements is such that it is not likely to be practical to meet this request. See also the Upward Compatibility guideline on page 5 of the Requirements Document. See Section 13.1.
- RR-0323: *Generalize slice for multidimensional arrays.* Rejected: insufficient user benefit (multi-dimensional slices). See Section 13.4.2.
- RR-0324: *Add more flexible support for string manipulation.* This request is considered under Study Topic S10.4-A(2). The RR suggests incorporating string manipulation operations that are supported in ICON, PL/I, and REXX.
- RR-0325: This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0325A: *Allow implementations to enforce local coding standards.* This request is considered under Requirement R9.3-A(1).
- RR-0325B: *Allow implementations to experiment with supersets.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0326: *Use a different syntax production style.* Rejected: a contradictory requirement was made. See Section 13.2. This RR suggests that the Ada syntax productions should provide more information about program legality and suggests that an attribute grammar should be used. This kind of stylistic change has been ruled out of scope by Requirement R2.1-B(1).
- RR-0327: *Add varying length strings to the language.* This request is considered under Study Topic S10.4-A(1).
- RR-0328: *Require compilers to report questionable uses of the language.* This request is considered under Requirement R9.3-A(1). This RR does not list any specific questionable uses.
- RR-0329: *Using a deferred constant before it has a value.* Rejected: The apparent problem raised by this request does not exist. The example given in the RR is illegal by 7.4.1(3). See Section 13.1.
- RR-0330: *Allow national characters in literals, comments, and identifiers.* This request is considered under User Need U3.1-A. This request is addressed by Requirements R3.1-(A1-5).
- RR-0331: *Need predefined LONG_CHARACTER (16 bits) and LONG_LONG_CHARACTER (32).* This request is considered under Requirement R3.1-A(2).
- RR-0332: *Provide unsigned integer capability.* This request is considered under Requirement R6.1-A(1). This RR provides a fairly extensive discussion of the need and the language design difficulties.
- RR-0333: *More precise definition of TEXT IO is needed, less implementation freedom.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. The RR says that there are problems but does not identify them.
- RR-0334: *Need to specify task parameters giving a task its work domain, e.g., to process part of an array.* This request is considered under Study Topic S7.2-A(1).

- RR-0335:** *Effect of abort statement is too implementation-dependent.* This request is considered under Requirement R5.3-A(1). The requirement addresses the problem raised in the RR.
- RR-0336:** *Allow array type definitions in records; nice for array-of-array case.* Rejected: insufficient user benefit (anonymous arrays as record components). See Section 13.4.4. LSN-222 discusses the potential complexity of allowing this capability. See Language Study Notes, 1983, available from the Ada Information Clearinghouse.
- RR-0337:** *Provide some form of user-modifiable priorities.* This request is considered under Requirement R5.2-A(1). Both mode changes and graceful degradation are mentioned in examples.
- RR-0338:** *Provide pointers to static objects and safe conversion between ADDRESS values and access values.* This request is considered under Requirement R6.4-A(1). Examples include large data structures such as maps residing in ROM. The use of unchecked conversion is too implementation-dependent and unsafe because addresses and access values do not necessarily have the same representation.
- RR-0339:** *Support sorting in extended alphabets.* Rejected: There does not appear to be any solution at the language level. See the discussion following Requirement R3.1-A(1). See Section 13.1.
- RR-0340:** *Allow optional simple name on CASE, IF, and SELECT statements.* This request is considered under Section A.3.13.
- RR-0341:** *Allow discriminant value in record aggregate to be non-static.* This request is considered under Requirement R2.2-C(1). The RR makes a useful suggestion for removing a restriction.
- RR-0342:** *Do not implement requests that will break generic code sharing.* This request is considered under Requirement R4.4-C(1). This RR discusses how changes in the rules for treatment of static types and expressions could impair generic code sharing possibilities. The RR discusses the potential effect of RR-0027 and RR-0048.
- RR-0343:** *Provide better facilities for conditional compilation.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0344:** *Need to simplify/relax the conformance rules.* This request is considered under Requirement R2.2-B(1).
- RR-0345:** *Need standardized interface to other ANSI languages.* Rejected: Since interfaces to other programming languages depend on both the language and the implementation, it isn't clear that anything useful can be done to solve the RR's problem in Ada 9X, despite the example solutions given in the RR. See Section 13.1.
- RR-0346:** *Need portable way to extract mantissa/exponent from floating point number.* This request is considered under Requirement R11.1-A(1).
- RR-0347:** *Allow applications to change priorities under program control; allow task priority to increase as a function of lack of service.* This request is considered under Requirement R5.2-A(1).
- RR-0348:** *Need predefined functions for real numbers, e.g., trig, log, etc.* This request is considered under Requirement R11.1-A(1).
- RR-0349:** *Interrupt addresses and memory addresses are conceptually different and should not be treated the same by the language.* This request is considered under Requirement R6.3-A(2). This RR presents what is believed to be a potential problem, but does not give any specific example of a difficulty imposed by the current approach.
- RR-0350:** *Clarify wording dealing with default initial values.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.
- RR-0351:** *Trusted systems require auto-scrubbing of memory when done with it.* Rejected: not a language issue. See Section 13.7.
- RR-0352:** *Require Calendar.Clock to return consistently accurate local system time.* This request is considered under Requirement R5.1-B(1). A real-time annex should specify constraints on timing accuracy.
- RR-0353:** *Unchecked conversion should eliminate compiler-dependent fields.* This request is considered under Requirement R2.4-A(1). The RR points out an important problem in dealing with unchecked conversion, although the proposed solution is not necessarily the correct one.
- RR-0354:** *Introduce dimensional mathematics into the language.* Rejected: too great a change from Ada 83 (dimensional mathematics). See Section 13.6.
- RR-0355:** *Standardize means of getting the OS command line arguments.* This request is considered under Requirement R2.4-A(1). At the very least, compilers running under the same operating system should have the same way of interacting with command line arguments. This RR makes an interesting proposal on how to achieve this effect.
- RR-0356:** *Need a way to get the compilation date and time within a program.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. This problem can be solved with a suitable environment tool.
- RR-0357:** *Need packed decimal, wide-ranging fixed-point, decimal deltas.* This request is considered under Study Topic S10.1-A(2).

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- RR-0358: *Need support for floor, ceiling, truncate, and whole operations.* This request is considered under Requirement R11.1-A(1).
- RR-0359: *Allow mixed case output for enumeration literals.* This request is considered under Requirement R4.6-B(1).
- RR-0360: *Add picture-formatting capabilities to TEXT IO.* This request is considered under Study Topic S10.4-A(2). The requirement does not go this far, but does suggest adding picture-formatting functions in a separate package.
- RR-0361: *Increase the number of options for controlling the output format of numbers.* This request is considered under Requirement R4.6-B(1).
- RR-0362: *Allow optional when clause on the raise statement.* This request is considered under Section A.3.4.
- RR-0363: *Allow 'VALUE' and 'IMAGE' to apply to real types as well as discrete types.* This request is considered under Section A.3.1.
- RR-0364: *Allow a subprogram body to be defined by generic instantiation.* This request is considered under Section A.4.1. An example is given using an instantiation of UNCHECKED_CONVERSION.
- RR-0365: *Reduce allowed variations in implementations to increase portability.* This request is considered under Requirement R2.4-A(1). RR-0432 is an expanded version of this RR.
- RR-0366: *Subtype natural should not include zero.* Rejected: too great a change from Ada 83. See Section 13.6. This change would be dangerously non-upward compatible. Moreover, mathematicians disagree on this.
- RR-0367: *Need support for national language character sets, including string comparison.* This request is considered under Requirement R3.1-A(1). The request for string comparison operations was not accepted, for reasons given in the Requirements document in the discussion following the requirement.
- RR-0368
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0368A: *Ensure unnecessary recompilation is avoided.* This request is considered under Study Topic S4.3-A(1).
- RR-0368B: *Ensure the library can be manipulated by tools other than those provided by the compiler vendor.* This request is considered under Study Topic S4.3-C(1).
- RR-0369: *Provide support for floating point standard IEEE-754.* This request is considered under Study Topic S11.1-B(1).
- RR-0370
This RR concerns five topics, each of which is treated separately. They are now listed.
- RR-0370A: *Can't recover space declared in library units when reconfiguring a system.* This request is considered under Requirement R8.2-A(1).
- RR-0370B: *Can't restart library level tasks.* This request is considered under Requirement R8.2-A(1).
- RR-0370C: *Library level tasks can't terminate.* This request is considered under Requirement R2.1-A(1). AI-00399 explains when such tasks can terminate.
- RR-0370D: *Need to set priorities of tasks during mode shifts.* This request is considered under Requirement R5.2-A(1).
- RR-0370E: *Need to recover space for task control blocks when tasks are created by an allocator.* This request is considered under Requirement R4.2-A(1).
- RR-0371: *Need more usable and portable machine code insertions.* Rejected: not desirable to ease machine code insertion. See Section 13.1.1.
- RR-0372: *Solve problem where heterogeneous processors view memory differently.* Rejected: a contradictory requirement was made. See Section 13.2. Dealing with heterogeneous shared memory systems is beyond the scope of the requirements (see Requirement R8.1-A(1)).
- RR-0373: *Need to be able to dynamically alter a program as it is running.* This request is considered under Requirement R8.2-A(1).
- RR-0374: *Ada should address memory management requirements in distributed systems.* This request is considered under Requirement R4.2-A(1).
- RR-0375: *Include formal memory protection/security.* Rejected: not a language issue. See Section 13.7. The ability to restrict access to pages of memory is too operation-system dependent to be a suitable language requirement.
- RR-0376: *Need special treatment of exceptions in distributed/parallel/multi-processor systems.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. The RR is very short and does not clearly indicate what problem needs to be solved.
- RR-0377: *Ada should allow partitioning of programs for multiple processor environments.* This request is considered under Requirement R8.2-A(1).
- RR-0378: *Need standard means of communication in distributed system.* This request is considered under Requirement R8.1-A(1).
- RR-0379: *Application should select the specific scheduling algorithm.* This request is considered under Requirement R5.2-A(1).
- RR-0380: *Need a task identifier for every task.* This request is considered under Study Topic S7.2-A(1). The RR gives a lengthy discussion of possible uses of task identifiers.

- RR-0381: *Records should have composed operations with respect to components.* This request is considered under Requirement R2.2-C(1).
- RR-0382: *Need to be able to rename and append to a file in standard Ada.* This request is considered under Requirement R4.6-B(1).
- RR-0383: *Need generic exceptions for truly reusable generic units.* This request is considered under Study Topic S4.4-A(1).
- RR-0384: *Cannot write subprogram which causes an exception after specified delay.* This request is considered under Requirement R5.1-C(1).
- RR-0385: *Need finalization code for packages.* This request is considered under Study Topic S4.2-A(2).
- RR-0386: *Need standard way of telling the compiler not to optimize.* This request is considered under Requirement R9.1-A(2).
- RR-0387: *Relax 11.6 optimization rules to allow compiler to do more optimizing.* This request is considered under Requirement R2.2-A(1).
- RR-0388: *Proposal for clean way of executing a subprogram by its address.* This request is considered under Requirement R4.1-B(1). A straightforward subprogram type provides a simpler solution than the approach proposed in this RR.
- RR-0389: *There is a need for "cyclic" discrete types in the language.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0390: *Need 8-bit unsigned CHARACTER for Greek and graphics symbols.* This request is considered under Requirement R3.1-A(1).
- RR-0391: *Clumsy syntax for based numbers, especially in aggregates.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0392: *Need "semi-limited" type with predefined := but no predefined =.* Rejected: too much implementor change for the payoff. See Section 13.5.
- RR-0393: *Can't get direct visibility of fixed point mult and div operator by renaming.* This request is considered under Section A.2.3.
- RR-0394: *Merge concepts of task and package into concept of an object.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. Insufficient motivation is given for the requested change.
- RR-0395: *Include formal parameter names in parameter/result-type profile.* This request is considered under Requirement R2.2-B(1). The RR points out that it is illegal to declare two subprograms with the same parameter and result type profile in the same declarative region even if corresponding formal parameter names are different. This illegality seems inconsistent to programmers since such subprograms can be unambiguously called using named parameter associations, and moreover, such overloads can occur as a result of USE clauses and generic instantiations (see, e.g., 12.3(22)). The Mapping/Revision Team may wish to consider whether this apparent irregularity should be preserved in Ada 9X. The RR points out that allowing such declarations may cause problems with renaming declarations, since if the subprogram being renamed is overloaded in this way, the overloading cannot be disambiguated based on the formal parameter names of the renamed subprogram.
- RR-0396: *Add library unit elaboration ordering rules to reduce need for pragma ELABORATE.* This request is considered under Section A.2.1.
- RR-0397: *Replace keyword PRAGMA with something capturing meaning better.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0398: *Need clearer/more selective rules for pragma INLINE applicability.* This request makes a useful suggestion for improvement in controlling the effect of pragma INLINE. See Section 2.2.9 of this document.
- RR-0399: *Break up overly broad predefined exceptions, e.g., CONSTRAINT_ERROR.* Rejected: This issue was given thorough consideration in the original design, and insufficient evidence is given in this RR to justify reconsidering the decision. See Section 13.1.
- RR-0400: *Do not allow a task to die silently on an unhandled exception.* This request is considered under Requirement R2.3-A(2). It is not clear what can be done, but the RR does point out a problem.
- RR-0401: *Mixed-base fixed-point operations cannot be done efficiently because of accuracy requirements.* This request is considered under Requirement R2.2-A(1). RR-592 duplicates the content of this RR.
- RR-0402: *Need unique hierarchical pathnames for subunit.* This request is considered under Study Topic S4.3-C(1).
- RR-0403: *Need to be able to get the name of the current exception.* This request is considered under Requirement R4.5-A(1).
- RR-0404: *Need convenient way to find out if a particular file exists.* This request is considered under Requirement R4.6-B(1).
- RR-0405: *Need convenient way to append to a file.* This request is considered under Requirement R4.6-B(1).
- RR-0406: *Allow user-defined attributes for user-defined types.* Rejected: insufficient user benefit (user-defined attributes). See Section 13.4.1.
- RR-0407
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0407A: *Need exception name, line number, and unit name where raised.* This request is consid-

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- ered under Requirement R4.5-A(1). This RR cites a requirement for logging exception information in information systems. The 9X requirement, however, does not go so far as to request contextual information such as the name of the compilation unit, source code line, etc. The requirement allows additional information to be made available if this can be done with little implementation cost.
- RR-0407B: *Do not allow a task to die silently on an unhandled exception.* This request is considered under Requirement R2.3-A(2). It is not clear what can be done, but the RR does point out a problem.
- RR-0408: *There is a need for generic formal entries.* This request is considered under Study Topic S4.4-A(1).
- RR-0409: *Define in the language how 3.5 rounds to integer.* This request is considered under Requirement R2.4-A(1).
- RR-0410: *Provide explicit language support for periodic tasks.* This request is considered under Requirement R5.1-B(1). This RR goes beyond the requirement since it requests direct language support for specifying task periodicity. The arguments should be considered, however, in evaluating Ada 9X proposals.
- RR-0411: *Express record representation clauses in a machine-independent way.* This request is considered under Requirement R2.4-A(1).
- RR-0412: *Allow overloaded = for all types, not just limited types.* This request is considered under Section A.3.9.
- RR-0413: *Allow user-written := for all types.* This request is considered under Study Topic S4.2-A(2).
- RR-0414: *Ada needs subprogram types and subprogram objects.* This request is considered under Requirement R4.1-B(1).
- RR-0415: *Allow priority inheritance, prioritized entry-queues, and prioritized selective wait.* This request is considered under Requirement R5.2-A(1).
- RR-0416: *Granularity of predefined exceptions is too coarse.* Rejected: insufficient user benefit (grouping exceptions). See Section 4.5-A(1). This issue was given thorough consideration in the original design, and insufficient evidence is given in this RR to justify reconsidering the decision.
- RR-0417: *Length clause should force allocation of EXACT number of bits.* This request is considered under Requirement R6.2-A(1). The interpretation of length clauses is actively under review by the ARG. In particular, see AI-00536, AI-00553, AI-00561, and AI-00825.
- RR-0418: *Representation clauses for array types need to be added.* This request is considered under Requirement R2.2-C(1).
- RR-0419: *Add some form of support for varying length strings to the language.* This request is considered under Study Topic S10.4-A(1).
- RR-0420: *Need file "extend" or "append" capability.* This request is considered under Requirement R4.6-B(1).
- RR-0421
This RR concerns four topics, each of which is treated separately. They are now listed.
- RR-0421A: *Need to delay in processing an interrupt.* This request is considered under Requirement R6.3-A(1).
- RR-0421B: *Interrupt address structure is sometimes different from memory address structure; a single type for both is inappropriate.* This request is considered under Requirement R6.3-A(2). No specific examples of problems are given.
- RR-0421C: *Need to associate interrupts with entries of task objects, not task types.* This request is considered under Requirement R6.3-A(2).
- RR-0421D: *The treatment of interrupts as ordinary, timed, or conditional calls may depend inappropriately on the run-time system.* This request is considered under Requirement R6.3-A(1). The point here is that the run-time system may insulate the application program too completely from hardware-dependent behavior, and so different implementations may behave differently even for the same target hardware.
- RR-0422: *Allow subprograms as parameters and maybe also as values.* This request is considered under Requirement R4.1-B(1).
- RR-0423: *Remove discriminant restriction on full declarations of private types.* This request is considered under Requirement R2.2-C(1). The RR raises some points worthy of consideration. It refers to AI-00037 for a complete discussion of the problem.
- RR-0424: *Allow names exported from an instance to be redefined during instantiation.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0425: *Need open ranges in declarations of real subtypes.* Rejected: There is no obvious notation, and the change is of marginal benefit. See Section 13.1.
- RR-0426
This RR concerns four topics, each of which is treated separately. They are now listed.
- RR-0426A: *The effect of an optional package body is confusing to users.* This request is considered under Section A.2.4.
- RR-0426B: *Allow declaration and body to be combined for generic subprograms.* This request is considered under Requirement R2.2-B(1).
- RR-0426C: *Omitting index constraint in constant arrays causes programmer errors.* Rejected: too great a change from Ada 83. See Section 13.6.

- RR-0426D: *Optional index in 'FIRST (and others) causes problems.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0427: *Do not permit a function to return a locally-declared task object.* This request is considered under Section A.1.1.
- RR-0428: *Order of declarations is too restrictive.* This request is considered under Section A.2.2. Specific anomalies mentioned are the inability to specify an address clause immediately after an entry declaration and the inability to specify a representation clause after a body has been declared.
- RR-0429: *Need construct that makes just overloadable declarations directly visible.* This request is considered under Section A.2.3.
- RR-0430
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0430A: *Need objects of a subprogram "type".* This request is considered under Study Topic S4.1-A(1).
- RR-0430B: *Need to pass subprograms as parameters.* This request is considered under Requirement R4.1-B(1).
- RR-0431: *A terminate alternative cannot be used to stop cyclic tasks.* This request is considered under Requirement R5.3-A(1). An asynchronous transfer of control construct might serve to meet the need described here.
- RR-0432: *Severely limit implementation options to improve portability.* This request is considered under Requirement R2.4-A(1). This RR gives a very extensive list of sections in the Standard that allow implementation-dependent choices to be made.
- RR-0433: *There is a need for predefined unsigned integer types.* This request is considered under Requirement R6.1-A(1).
- RR-0434: *Need atomic read/write operations on shared volatile memory.* This request is considered under Requirement R7.1-A(1).
- RR-0435: *Need secondary standard for simple Ada subset for safety-critical applications.* This request is considered under Requirement R9.3-A(1). The requirement does not propose that Ada 9X will provide such a standard, but it does allow an independently-developed standard to be enforced.
- RR-0436: *Clarify task synchronization point inconsistencies.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. This problem should be addressed.
- RR-0437: *Provide "supertype" capability for merging enumeration types.* Rejected: insufficient user benefit (discontiguous subtypes). See Section 13.5.3.
- RR-0438: *Allow use of multi-octet character set.* This request is considered under Requirement R3.1-A(2).
- RR-0439: *Require automatic garbage collection.* This request is considered under Requirement R4.2-A(1).
- RR-0440: *Extend Ada to be truly object-oriented.* This request is considered under Study Topic S4.3-B(1).
- RR-0441: *Extend Ada to allow for polymorphism.* This request is considered under Study Topic S4.1-A(1).
- RR-0442: *Extend Ada to allow a package type hierarchy.* This request is considered under Study Topic S4.3-B(1).
- RR-0443: *Need for anonymous array types as record components.* Rejected: insufficient user benefit (anonymous arrays as record components). See Section 13.4.4. LSN-222 discusses the potential complexity of allowing this capability. See Language Study Notes, 1983, available from the Ada Information Clearinghouse.
- RR-0444: *Let the user limit the places where a given exception can be raised.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0445: *Non-staticness of generic formal parameters poses problems.* This request is considered under Study Topic S4.4-A(1). This RR argues that it should generally be possible to turn a non-generic unit into a generic unit, but this is not easily possible when the non-generic unit uses static expressions (in case statements, aggregates, and type declarations) that depend on formal parameters in the generic version.
- RR-0446: *Tighten the contract model by distinguishing constrained/unconstrained generic types.* This request is considered under Study Topic S4.4-B(2).
- RR-0447: *Need to be able to preserve/restore the default file at any point.* This request is considered under Requirement R4.6-B(1). This RR provides a useful argument for the requested capability.
- RR-0448: *Allow different sets of subprograms to depend on common declarations.* This request is considered under Study Topic S4.3-B(1).
- RR-0449: *Do not allow unchecked conversion of private types.* Rejected: Unchecked conversion exists as an escape mechanism whose usage should not be restricted by the language. Local controls on its use could be enforced in response to Requirement R9.3-A(1). See Section 13.1.
- RR-0450: *Need efficient manipulation of buffers whose type is determined at run time.* This request is considered under Study Topic S6.4-B(1). The RR gives an example of a use of the capabilities called for in the requirement.

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- RR-0451: *Changes to package constants should not cause recompilation.* This request is considered under Study Topic S4.3-A(1).
- RR-0452: *Allow constant functions in static expressions (or overloadable constants).* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. The RR gives no examples showing why such functions are needed in contexts where the language requires static expressions (e.g., in the choice of a case statement).
- RR-0453: *Provide a special function or attribute yielding the sign of a numeric value.* This request is considered under Requirement R11.1-A(1).
- RR-0454: *Need Entire function or attribute for real types.* This request is considered under Requirement R11.1-A(1).
- RR-0455: *The import and export mechanisms of Ada are too limited.* This request is considered under Study Topic S4.3-B(1). This RR contains a fairly extensive discussion of problems that are relevant to the Study Topic.
- RR-0456: *Allow initialization to be associated with a type definition.* This request makes a useful suggestion for improvement in default initialization capabilities. See Section 2.2.2 of this document.
- RR-0457: *Structure library units as groups, control visibility of library units.* This request is considered under Study Topic S4.3-C(1).
- RR-0458: *Need convenient way to escape into weakly typed subprogram call.* This request is considered under Study Topic S4.4-A(1).
- RR-0459: *Improve support for interoperability; lessen implementation dependence.* This request is considered under Requirement R2.4-A(1). This RR lists several areas for consideration: representation clauses, the effect of pragma PACK, the effect of unchecked conversion, and permissible optimizations. An extensive and helpful discussion is provided.
- RR-0460: *Ada needs to provide support for unsigned integer types.* This request is considered under Requirement R6.1-A(1). This RR provides an extensive discussion of the issues and a detailed solution that helps to indicate the full range of the requirement.
- RR-0461: *Provide standard package of semaphore operations.* This request is considered under Requirement R5.2-A(2).
- RR-0462: *Allow selected component form of type mark in a formal part even when the selected component has the same identifier as the subprogram.* This request is considered under Section A.3.7.
- RR-0463: *'Size is unclear; perhaps need 'Spacing and 'Allocation.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0464: *Should be able to set STORAGE_SIZE for task objects as well as types.* This request is considered under Section A.3.5.
- RR-0465: *Need a way to get the representation from an enumeration value and vice versa.* This request makes a useful suggestion for improvement in the ability to determine the representation of enumeration values. See Section 2.2.14 of this document.
- RR-0466: *Allow user-defined finalization for objects of a type to ensure release of resources.* This request is considered under Study Topic S4.2-A(2).
- RR-0467: *Need convenient way to rename a type and get its operations.* This request is considered under Section A.2.3.
- RR-0468: *No generic way to handle exceptions raised by generic formal subprograms.* This request is considered under Study Topic S4.4-A(1).
- RR-0469: *Parameter names for language-defined pragmas should be defined.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0470: *Allow renaming or generic instantiation to define a subprogram body.* This request is considered under Section A.4.1. Reasonable examples are given.
- RR-0471: *Allow specification of parameter modes in subprogram calls for clarity.* Rejected: too great a change from Ada 83. See Section 13.6. This feature was considered explicitly and rejected in the initial design.
- RR-0472: *Distinguish unconstrained/constrained generic formal types.* This request is considered under Study Topic S4.4-B(2).
- RR-0473: *Allow "partially" constrained subtypes of discriminated records.* Rejected: too much implementor change for the payoff. See Section 13.5.
- RR-0474: *Need direct visibility to just enumeration literals and operators of a type.* This request is considered under Section A.2.3.
- RR-0475: *Need automatically-invoked user-defined routines to reclaim storage.* This request is considered under Study Topic S4.2-A(2).
- RR-0476: *Allow user-written type-conversion functions with the same name as the target type.* Rejected: too great a change from Ada 83. See Section 13.6. The proposal would require significant change to the visibility rules and the overload resolution model.
- RR-0477: *Provide a way to get the name and location of a raised exception.* This request is considered under Requirement R4.5-A(1). Obtaining traceback information is not part of the 9X requirement.
- RR-0478: *Add language facilities for restricting use of resources to trusted packages.* Rejected: Pro-

- viding special-purposes pragmas for such purposes is beyond the scope of the revision effort. See Section 13.1.
- RR-0479: *Need standard subprograms to get user-interface information from OS.* Rejected: This is not a bad idea, but there are more important issues that deserve attention. See Section 13.1.
- RR-0480: *Need standard means of sending messages between Ada programs.* This request is considered under Requirement R8.1-A(1).
- RR-0481: *Make Ada documentation available in SGML format.* This request is considered under Requirement R2.1-C(1).
- RR-0482: *Multiple derived types from same package do not generate needed operations.* This request is considered under Study Topic S4.3-B(1). Specialization/extension facilities should help solve this problem.
- RR-0483: *Allow an instantiated subprogram to have the same identifier as the generic unit (as is allowed for package instances).* This request is considered under Section A.3.7.
- RR-0484: *Add DEFAULT xy functionality as parameters to generic TEXT IO packages.* This request is considered under Requirement R4.6-B(1). This RR proposes a simple, upward-compatible solution that improves the usability of the numeric IO packages.
- RR-0485: *Provide means to get the line length of an input or output device.* This request is considered under Requirement R4.6-B(1).
- RR-0486: *Allow generic formal task types as well as generic formal limited types.* This request is considered under Study Topic S4.4-A(1). This RR points out that if a generic unit expects a task as an actual parameter, the programmer is unable to express this requirement.
- RR-0487: *Need private task entries for exclusive use within the task.* This request makes a useful suggestion for improvement in restricting the visibility of task entries. See Section 2.2.11 of this document.
- RR-0488: *Allow generic formal entries as well as generic formal subprograms.* This request is considered under Study Topic S4.4-A(1). This RR gives an example of how a generic formal entry would be used to achieve the effect of an asynchronous call.
- RR-0489: *Allow machine-code insertions in functions as well as procedures.* Rejected: not desirable to ease machine code insertion. See Section 13.1.1.
- RR-0490: *Need successful/convenient recovery from exceptions in machine code insertions.* This request is considered under Requirement R2.3-A(2). This simple request might improve safety of use of machine code insertions.
- RR-0491: *Code would be clearer if one could EXIT from a block statement.* Rejected: too difficult to distinguish exiting from a block inside a loop. See Section 13.1.2.
- RR-0492: *Decouple mantissa and exponent information in floating point type definitions.* This request is considered under Study Topic S11.1-B(1).
- RR-0493: *A programmer should be able to ensure that storage will be reclaimed.* This request is considered under Requirement R4.2-A(1).
- RR-0494: *Allow slices for any dimension in multidimensional arrays.* Rejected: insufficient user benefit (multi-dimensional slices). See Section 13.4.2.
- RR-0495: *Remove leading space in the result of the 'IMAGE attribute for integers.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0496: *Clarify termination of tasks whose masters are library units.* This request is considered under Requirement R2.1-A(1). AI-00399 defines the effect of termination on library-level tasks.
- RR-0497: *Presence of default discriminants for types used as generic actual can yield a surprising run-time error.* Rejected: not a language issue. See Section 13.7. The problem raised in this RR is really a problem of correctly using the language rather than a language problem, particularly since the proposed solution would allow a constrained access variable to inadvertently designate an incorrectly constrained object.
- RR-0498: *Make selective wait symmetrical with respect to accept statements and entry calls.* This request is considered under Requirement R5.2-A(2).
- RR-0499: *Like other "blocks", allow exception handlers in accept statements.* This request is considered under Section A.3.2.
- RR-0500: *More terms should be hyphenated to improve clarity.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.
- RR-0501: *The Standard should be consistent in delimiting section headings.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.
- RR-0502: *The Standard should be consistent in its use of upper and lower cases.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.
- RR-0503: *Provide subprogram types for dispatcher-style programming.* This request is considered under Study Topic S4.1-A(1). This RR was particularly useful in formulating the associated User Need and requirement.
- RR-0504: *Add an exchange operator.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.

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RR-0505

This RR concerns two topics, each of which is treated separately. They are now listed.

RR-0505A: *Provide extendable record types.* This request is considered under Study Topic S4.3-B(1).

RR-0505B: *Allow partial match for records as generic parameters.* This request is considered under Study Topic S4.4-A(1).

RR-0506: *Allow initialization to be associated with a type definition.* This request makes a useful suggestion for improvement in default initialization capabilities. See Section 2.2.2 of this document.

RR-0507: *Provide information/control over row-major or column-major ordering.* This request is considered under Study Topic S11.2-A(1). The RR gives a detailed discussion of the inefficiency caused by Ada rules.

RR-0508: *Allow slices for any dimension in multidimensional arrays.* Rejected: insufficient user benefit (multi-dimensional slices). See Section 13.4.2.

RR-0509: *Allow user-defined attributes for user-defined or private types.* Rejected: insufficient user benefit (user-defined attributes). See Section 13.4.1.

RR-0510: *Re-indexing arrays via type conversions.* This RR is discussed in Section 2.2.10 on page 10 of this document.

RR-0511: *Allow use of a base type within a generic unit.* This request is considered under Study Topic S4.4-A(1).

RR-0512: *Provide subprograms as parameters to subprograms.* This request is considered under Requirement R4.1-B(1). This RR gives some examples of the limitations of using generic parameters as a means of getting the effect of passing subprograms as parameters.

RR-0513: *Allow overloading of = for any type, e.g., returning an array type.* This request is considered under Section A.3.9. As the RR points out, there is no strong reason to limit the result type of the equality operators.

RR-0514: *Provide support for simple parallel threads within a program unit.* This request is considered under Study Topic S7.3-A(1). Some of the requested functionality is included in the requirement.

RR-0515: *Need ability to request indivisible update for specific objects, especially in distributed systems.* This request is considered under Study Topic S4.2-A(2). The submitter objects to the need to explicitly program mutual exclusion when making assignments to specific objects, and would like to have the assignment operation imply indivisible update. This capability could be provided by user-defined assignment.

RR-0516: *Provide more support for object-oriented programming.* This request is considered under Study Topic S4.3-B(1).

RR-0517: *Provide syntax to declare program units free from side-effects.* This request is considered under Requirement R9.3-A(1). It is not clear that the benefits are worth the costs in language complexity and compiler checks.

RR-0518: *Provide syntax to declare subprogram pre/post conditions.* Rejected: The desired checks can be written in the existing language in a way that permits the optimizer to take advantage of the checks. See Section 13.1.

RR-0519: *Simplify overload rules for ambiguous/universal expressions.* Rejected: These issues were considered thoroughly in the original design, and it is unlikely that the rules can be improved in general without introducing other anomalies. Of course, the -1..10 case (Section A.3.12) should be fixed, but this is not an overloading resolution anomaly but rather a special case rule. See Section 13.1.

RR-0520: *Language should distinguish "sequence" and "mapping" arrays.* Rejected: It is far from clear that adding a new type would create a simpler, less easily misused language. See Section 13.1.

RR-0521: *Need more convenient support for use of shared memory among tasks.* This request is considered under Requirement R5.2-A(2).

RR-0522: *Allow non-discrete record discriminants.* This request is considered under Requirement R2.2-C(1).

RR-0523: *Allow user-defined finalization for objects of a type to ensure release of resources.* This request is considered under Study Topic S4.2-A(2).

RR-0524: *Allow functions to return references to components of objects; allow programmer to ensure pass by reference for any object.* This request is considered under Requirement R6.4-A(1).

RR-0525: *Extend Ada to allow for polymorphism and inheritance.* This request is considered under Study Topic S4.3-B(1).

RR-0526

This RR concerns three topics, each of which is treated separately. They are now listed.

RR-0526A: *Allow exceptions to be grouped under a single name.* Rejected: insufficient user benefit (grouping exceptions). See Section 4.5-A(1).

RR-0526B: *Need to pass exceptions as parameters to generic units and subprograms.* This request is considered under Study Topic S4.4-A(1).

RR-0526C: *Need to determine the name of a raised exception.* This request is considered under Requirement R4.5-A(1).

RR-0527: *Standardize information/conventions used for pragma INTERFACE.* This request is considered under Requirement R4.1-B(2).

- RR-0528: *Change Ada character names to recognized names for verbal communication.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document. The problem addressed in the RR is the names assigned to characters in Section 2.1(15) and 2.2(10). The RR cites federal law requiring facilities for the handicapped.
- RR-0529: *Allow selection of operations based on run-time queries about properties of types.* Rejected: too much implementor change for the payoff. See Section 13.5. A fully general ability to query type descriptors at run-time is requested here.
- RR-0530: *Insufficient support for mutants of limited types.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3.
- RR-0531: *Variants of a type can't be usefully supported with current variant record approach.* This request is considered under Study Topic S4.3-B(1). Although this RR discusses variant record limitations, the real problem being addressed is the ability to construct efficiently representable alternative representations for a conceptual type. The RR mentions explicitly that object-oriented languages allow this kind of problem to be solved more straightforwardly.
- RR-0532: *Allow same-type record components in different variants to share name.* This request makes a useful suggestion for improvement in variant record declarations. See Section 2.2.6 of this document. RR-0707 provides a careful analysis of this problem.
- RR-0533: *Mutually recursive types from different packages cannot be done.* This request is considered under Study Topic S4.3-B(1). This is an example of a problem that might be solvable with suitable facilities for specializing/extending packages and types.
- RR-0534: *Allow brackets other than "(", ")" in aggregates, etc.* This request makes a useful suggestion for improvement in the kinds of parenthesization allowed by the language. See Section 2.2.13 of this document.
- RR-0535: *Provide CEILING and FLOOR numeric operators.* This request is considered under Requirement R11.1-A(1).
- RR-0536: *Provide MIN and MAX numeric operators.* This request is considered under Requirement R11.1-A(1).
- RR-0537: *Separate integer divide and floating divide as in Pascal.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0538: *Create new loop structure which bans the EXIT statement.* This request is considered under Requirement R9.3-A(1). A pragma could be used to forbid use of the exit statement.
- RR-0539: *Allow reading of OUT parameters.* This request is considered under Section A.3.10.
- RR-0540: *Allow a new package to build on an existing package.* This request is considered under Study Topic S4.3-B(1).
- RR-0541: *Allow user-defined :=, =, DESTROY operations to support memory management.* This request is considered under Study Topic S4.2-A(2). This RR gives a very lengthy discussion and examples showing why user-defined assignment and finalization are needed to provide appropriate memory management functionality under user control.
- RR-0542: *One way or another allow usage of private type before its completion declaration.* This request makes a useful suggestion for improvement in the ability to use private types before their full declaration. See Section 2.2.5 of this document. The need here may be met indirectly by solutions for User Need U4.3-B. AI-00327 contains more detail about the problem.
- RR-0543: *Allow accept statements in subprograms nested inside tasks.* This request makes a useful suggestion for improvement in the ability to modularize code in task bodies. See Section 2.2.7 of this document.
- RR-0544: *Need indivisible update on reference counts.* This request is considered under Study Topic S4.2-A(2). This RR briefly discusses the difficulties of maintaining reference counts for data shared among tasks. It may provide an interesting example to use when evaluating Ada 9X solutions.
- RR-0545: *Subunits should not have to be at the outermost compilation unit level.* Rejected: The ability to declare a subunit in a nested block would require extra complications in requiring that all enclosing blocks be named. Allowing subunit declarations in nested units but not in blocks would seem to be a non-uniformity, so there is no easy way to provide the requested capability. See Section 13.1.
- RR-0546: *It is too difficult to ensure that pragma ELABORATE is used when it is needed.* This request is considered under Section A.2.1. This RR gives some examples of problems involving pragma ELABORATE.
- RR-0547: *Like non-generic subprograms, allow merge of specification/body for generic subprograms.* This request is considered under Requirement R2.2-B(1). RR-0760 duplicates the content of this RR.
- RR-0548: *Allow convenient syntax for instantiating a nested generic unit.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0549: *Ensure the use of unconstrained actual types is always legal.* This request is considered under Study Topic S4.4-B(2).
- RR-0550: *Allow subprogram bodies to be defined by RENAMES or generic instantiation.* This re-

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- quest is considered under Section A.4.1.
RR-0761 duplicates the content of this RR.
- RR-0551: *Need assignment capability for TEXT IO FILE TYPE.* This request is considered under Requirement R4.6-B(1). See RR-0447 for a workaround that can be used today. RR-0762 duplicates the content of this RR.
- RR-0552: *Need "padded" line input with truncation and pad-fill to LENGTH.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0553: *GET LINE should not automatically call SKIP LINE.* This request is considered under Requirement R4.6-B(1).
- RR-0554: *Need constraint checks for target of Unchecked Conversion and I/O input.* This request is considered under Requirement R9.1-A(2). Section 11.6 of Standard allows seemingly redundant constraint checks to be optimized away.
- RR-0555: *Need "selective" USE clause to get just operators and subprograms of a type.* This request is considered under Section A.2.3.
- RR-0556: *Parentheses are used for too many purposes in the language.* This request makes a useful suggestion for improvement in the kinds of parenthesization allowed by the language. See Section 2.2.13 of this document.
- RR-0557: *The use of renaming declarations to provide subprogram bodies helps get around the inability to overload subunit names.* This request is considered under Study Topic S4.3-C(1).
- RR-0558: *Deriver of type should be able to hide subset of derived operations.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. The ability to hide some derived operations would add more complexity to the language than is acceptable to most users.
- RR-0559: *If allow reading of OUT parameters, initialize OUT access to NULL.* Rejected: too great a change from Ada 83. See Section 13.6. There is no particular advantage in initializing an out parameter to null rather than to the value of its actual parameter. Moreover, such a change would be inconsistent with the current rule for components of an access type.
- RR-0560: *Need to access a private type's representation in related packages.* This request is considered under Study Topic S4.3-B(1).
- RR-0561: *Allow case statement to operate on strings for string processing.* Rejected: too much implementor change for the payoff (non-static case labels). See Section 13.5.2.
- RR-0562: *Require separate compilation of generic specifications and bodies.* This request is considered under Requirement R4.4-B(1).
- RR-0563: *Need to allow subprogram types and variables.* This request is considered under Study Topic S4.1-A(1).
- RR-0564: *Allow implementation freedom to include more mantissa digits in floating point safe numbers.* This request is considered under Study Topic S11.1-B(1).
- RR-0565: *'SMALL' is unsuitably defined; need for representation clauses inappropriate.* This request is considered under Requirement R2.2-B(1).
- RR-0566: *Fixed point model numbers should include the bounds of the type definition.* This request is considered under Requirement R2.2-B(1).
- RR-0567: *Allow variable declaration to get constraints from initial value.* This request is considered under Requirement R2.2-C(1).
- RR-0568: *Allow non-nested variant parts in record types.* This request is considered under Requirement R2.2-C(1).
- RR-0569: *Relax rules separating basic from later declarative items.* This request is considered under Section A.2.2.
- RR-0570: *Allow the prefix of a name to denote a renaming of an enclosing construct.* Rejected: AI-00119 discusses the reasons for this restriction. See Section 13.1.
- RR-0571
This RR concerns two topics, each of which is treated separately. They are now listed.
- RR-0571A: *Allow use of OTHERS choice with named associations when index bounds are determined by context.* This request is considered under Section A.2.5.
- RR-0571B: *Clarify the effect when the choice in an aggregate is outside the range of the applicable index constraint.* This request is considered under Requirement R2.1-A(1). AI-00309 deals with this problem.
- RR-0572: *Need predefined operators with respect to all predefined integer types.* Rejected: The change would require revision of the overloading rules because $X**2$ would become ambiguous. See Section 13.1.
- RR-0573: *Slide indices of array aggregates for record component initialization and as components of record aggregates.* This request is considered under Section A.3.11.
- RR-0574: *Inability to eliminate constraint check for OUT parameters.* This request is considered under Requirement R2.2-A(1). This RR points out a situation in which a redundant constraint check must be performed both inside and outside a procedure.
- RR-0575: *Need better (more selective) control over inlining.* This request makes a useful suggestion for improvement in controlling the effect of pragma INLINE. See Section 2.2.9 of this document.

- RR-0576: *Allow parameter default expressions to make use of previous IN parameters.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. This request is harder to satisfy than may appear at first, since it requires, in effect, that actual parameters be evaluated in an order dictated by the order of the formal parameters and is a potential complication for implementers without strong benefit to users.
- RR-0577: *Allow deferred constant of composite type having a component of an incompletely declared private type.* This request is considered under Requirement R2.2-C(1).
- RR-0578: *Out-mode parameters of limited private types should be allowed.* This request makes a useful suggestion for improvement in the treatment of subprogram parameters. See Section 2.2.3 of this document. This RR gives a good example to show why this restriction should be relaxed to allow good modular programming practices to be supported.
- RR-0579: *Allow a type mark of form P.FOO in the formal part of a subprogram named FOO.* This request is considered under Section A.3.7.
- RR-0580: *Allow accepts within subprograms/packages nested inside tasks.* This request makes a useful suggestion for improvement in the ability to modularize code in task bodies. See Section 2.2.7 of this document.
- RR-0581
This RR concerns three topics, each of which is treated separately. They are now listed.
- RR-0581A: *Eliminate need for pragma ELABORATE; pragma NOT_ELABORATE might help.* This request is considered under Section A.2.1. This RR contains some detailed discussion and examples.
- RR-0581B: *Clarify the effect of applying pragma ELABORATE to a package that has no body.* This request is considered under Requirement R2.1-A(1). AI-00236 specifies the effect of the pragma in these cases.
- RR-0581C: *Allow a pragma ELABORATE for a subunit to mention a package name given in the context clause of a parent library unit.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0581: *Rules specifying the position of pragma ELABORATE are error-prone and unhelpful.* This request is considered under Section A.2.1.
- RR-0582: *Provide standard interface for getting additional implementation-dependent info about state when an exception is raised.* This request is considered under Requirement R4.5-A(1). The requirement allows additional information to be made available if this can be done with little implementation cost.
- RR-0583: *Delete NUMERIC_ERROR if now subsumed under CONSTRAINT_ERROR.* This request is considered under Requirement R2.1-A(1). AI-00387 recommends that NUMERIC_ERROR be replaced with CONSTRAINT_ERROR.
- RR-0584: *Need stricter checking of formal generic subtypes when an instantiation is given.* This request is considered under Study Topic S4.4-B(2). This RR provides a careful discussion of an error-prone aspect of generics, namely, the fact that formal subtypes are sometimes ignored in matching actual parameters.
- RR-0585: *Need pragma to specify code-generation strategy for generic instantiation.* This request is considered under Requirement R4.4-C(1).
- RR-0586: *Different instantiations of the same generic unit may have to evaluate their actual parameters in different orders.* This request is considered under Requirement R4.4-C(1). The RR asserts that for a stack machine, this causes inefficiencies for shared-code generics.
- RR-0587: *Provide for communication between loosely coupled tasks.* This request is considered under Requirement R5.4-A(1).
- RR-0588: *Provide a form of USE clause that hides outer homographs.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. RR-0589 duplicates the content of this RR.
- RR-0589: *Need stronger kind of USE for less dependence on containing scope.* This RR duplicates the content of RR-0588; it is not discussed further.
- RR-0590: *Need clear, efficient, standard support for mutual exclusion.* This request is considered under Requirement R5.2-A(2). This RR gives a detailed example of a problem that is to be solved by improved mechanisms in Ada 9X.
- RR-0591: *Allow fixed-point multiply/divide with universal real operands.* This request makes a useful suggestion for improvement in the ability to use real literals in fixed point expressions. See Section 2.2.8 of this document.
- RR-0592: *Clean up required accuracy for composite fixed-point operations.* This RR duplicates the content of RR-0401; it is not discussed further.
- RR-0593: *Mandate implementation of variant record I/O in DIRECT_IO/SEQUENTIAL_IO.* This request is considered under Requirement R4.6-B(1). The required functionality is available in principle by using "shared files", as suggested in the discussion following Requirement R4.6-B(1).
- RR-0594: *Relax rules separating basic from later declarative items.* This request is considered under Section A.2.2.
- RR-0595: *Allow default initialization for all types.* This request makes a useful suggestion for improvement in default initialization capabilities. See Section 2.2.2 of this document.

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- RR-0596: *Allow END type name to substitute for END RECORD.* This request is considered under Section A.3.13.
- RR-0597: *Need functional version of GET_LINE instead of procedural.* This request is considered under Requirement R4.6-A(1). RR-0047 gives a stronger justification for this change.
- RR-0598: *Permit function parameters to have modes OUT and IN OUT.* Rejected: insufficient user benefit (OUT modes for functions). See Section 13.4.3.
- RR-0599: *Certain changes to derived/private types will help inheritance.* This request is considered under Study Topic S4.3-B(1). This RR gives some generic examples of difficulties of extending existing units to meet new needs.
- RR-0600: *Allow formal parameter names in parameter/result-type profile.* This request is considered under Requirement R2.2-B(1). See the comment for RR-0395.
- RR-0601: *Allow library-level declarations to be defined by RENAMES.* This request is considered under Requirement R2.2-C(1).
- RR-0602: *Encourage implementors to support standardized libraries.* This request was met — This request is properly met by an Annex. See Section 1.2 of the Requirements Document.
- RR-0603: *Allow discontinuous subtypes of discrete types.* Rejected: insufficient user benefit (discontinuous subtypes). See Section 13.5.3.
- RR-0604: *Like non-generic subprograms, allow merge of specification/body for generic subprograms.* This request is considered under Requirement R2.2-B(1).
- RR-0605: *Rules for OTHERS in aggregates are confusing.* This request is considered under Section A.2.5.
- RR-0606: *Allow generic subprogram names to be overloaded.* Rejected: insufficient user benefit (overloaded generic names). See Section 13.5.4.
- RR-0607: *Allow names of compilation units to be overloadable, operator symbols.* Rejected: Although it may seem more uniform to allow library unit names to be overloaded, a with clause naming such a unit would be unresolvably ambiguous. See Section 13.1.
- RR-0608: *Allow recursive generic instantiations.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. It is not clear how this could be implemented.
- RR-0609: *Allow user-defined override of =, /=, := on all types.* This request is considered under Study Topic S4.2-A(2).
- RR-0610: *Why not allow RENAMES for types and subtypes?* This request is considered under Requirement R2.2-C(1).
- RR-0611: *Allow subprogram types, variables, constants, parameters, etc.* This request is considered under Study Topic S4.1-A(1). This RR was helpful in formulating the associated User Need and the requirement.
- RR-0612: *Should allow both delay and terminate alternatives in selective wait.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. The intended semantics is not clear.
- RR-0613: *User-defined attributes solve portability problems with implementation-defined attributes.* Rejected: insufficient user benefit (user-defined attributes). See Section 13.4.1.
- RR-0614: *Allow WHEN condition RETURN to make selection of returned value clearer.* This request is considered under Section A.3.4.
- RR-0615: *Define LOOP/UNTIL control structure as in Pascal.* This request makes a useful suggestion for improvement in iteration constructs. See Section 2.2.12 of this document.
- RR-0616: *Require compilers to diagnose statically-detectable constraint errors.* This request is considered under Study Topic S2.3-A(1).
- RR-0617: *Eliminate anonymous array types.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0618: *Ban GOTO statement.* Rejected: Tools that produce Ada code need to be able to generate GOTOs. See Section 13.1.
- RR-0619: *Eliminate three replacement characters, stick to normal ASCII.* This request is considered under Requirement R2.2-B(1). Simplifying the language by removing these alternatives is not upward compatible, but few programs use these replacement characters.
- RR-0620: *Ban RETURN statement except inside functions.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0621
This RR concerns three topics, each of which is treated separately. They are now listed.
- RR-0621A: *Need to find out which exception has been raised.* This request is considered under Requirement R4.5-A(1).
- RR-0621B: *Permit exceptions as generic formals.* This request is considered under Study Topic S4.4-A(1).
- RR-0621C: *Allow case statements to dispatch on value of an exception.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. The intent here is to call a procedure in an "others" handler with the actual exception as a parameter. A case statement in the procedure body dispatches on the actual exception value. This is an interesting idea, but not of sufficient value to fall under one of the stated requirements.
- RR-0622: *The Standard should use "metatype" in describing generic formal types.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.

- RR-0623: *Define RANGE attribute for discrete ranges.* This request is considered under Section A.3.3.
- RR-0624: *Provide selective direct visibility into a package.* This request is considered under Section A.2.3. The requirement addresses some of the request.
- RR-0625: *Change EXIT/WHEN to WHEN/EXIT to parallel Ada IF and English.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0626: *Files produced by SEQUENTIAL IO and DIRECT IO are not portable among compilers, even for the same target machine e.g., because of dope vectors.* This request is considered under Requirement R6.2-A(1).
- RR-0627: *Allow partial match to formal type for records.* This request is considered under Study Topic S4.4-A(1).
- RR-0628: *Need private task entries.* This request makes a useful suggestion for improvement in restricting the visibility of task entries. See Section 2.2.11 of this document.
- RR-0629: *Need procedure and function types for use in subprogram calls.* This request is considered under Requirement R4.1-B(1).
- RR-0630: *Due to high implementation costs, define/allow Ada subsets.* Rejected: a contradictory requirement was made. See Section 13.2. The Requirements Team explicitly considered and rejected the notion of allowing subsets as not being consistent with the goals of the revision effort. See Section 1.2 of the Requirements Document.
- RR-0631: *Make conformance rules consistent.* This request is considered under Requirement R2.2-B(1).
- RR-0632: *Allow EXIT from a block statement for consistency.* Rejected: too difficult to distinguish exiting from a block inside a loop. See Section 13.1.2.
- RR-0633: *Provide logical operations (e.g., XOR) for integers.* This request is considered under Requirement R6.1-A(1).
- RR-0634: *Provide arithmetic shift operations for integers.* This request is considered under Requirement R6.1-A(1).
- RR-0635: *Provide basic support for extended precision integer arithmetic.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0636: *Improve Ada's axioms for floating point operations.* This request is considered under Study Topic S11.1-B(1).
- RR-0637: *Aaa programs should run as though negative zero did not exist.* This request is considered under Study Topic S11.1-B(1). This is a complex issue that is being considered by the Numerics Rapporteur Group of ISO-IEC/JTC1/SC22/WG9.
- RR-0638: *Axioms for built-in operations should be specified explicitly.* Rejected: This was considered and rejected in the initial design as being unnecessary for clarity and precision. The current wording is adequate. See Section 13.1.
- RR-0639: *Need compile-time initialization of complex data structures.* This request is considered under Requirement R8.2-A(1). This problem may be better solved with a separate CASE tool.
- RR-0640: *Need to access chunk of a bit vector as a whole.* This request is considered under Requirement R6.1-A(1). The requirement provides much of the requested functionality.
- RR-0641: *Add subprograms as parameters to the language.* This request is considered under Requirement R4.1-B(1).
- RR-0642: *Add label variables to support use of finite state machines.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0643: *Garbage collection can now be done well; encourage its use.* This request is considered under Requirement R4.2-A(1). Section 4.2 of the Requirements Document addresses this topic further.
- RR-0644: *Standard should specify time bounds/constraints for certain operations.* This request is considered under Study Topic S9.1-A(1). This RR provides some possibly helpful examples of performance constraints that might be imposed in an Ada 9X annex.
- RR-0645: *Need mantissa/exponent extraction and manipulation.* This request is considered under Requirement R11.1-A(1).
- RR-0646: *Allow exceptions to be parameterized with parameters read in handler.* Rejected: a contradictory requirement was made. See Section 13.2. The requirements for exceptions are much less ambitious because of potential implementation overhead.
- RR-0647: *Need ability to select actions depending on state without using case statements.* This request is considered under Study Topic S4.1-A(1).
- RR-0648: *Need to set STORAGE_SIZE on task objects, not task types.* This request is considered under Section A.3.5.
- RR-0649: *Allow default initialization for all types (not just records).* This request makes a useful suggestion for improvement in default initialization capabilities. See Section 2.2.2 of this document.
- RR-0650: *Allow non-static case statement choices, non-discrete case statement expression.* Rejected: too much implementor change for the payoff (non-static case labels). See Section 13.5.2.
- RR-0651: *Allow one task to raise an exception in another task.* This request is considered under

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- Requirement R5.3-A(1). A different solution to the problem is called for.
- RR-0652: *Declaring a subtype should make the equality operator directly visible.* This request is considered under Section A.2.3.
- RR-0653: *Need to declare constants whose value is supplied after linking.* This request is considered under Requirement R8.2-A(1).
- RR-0654: *Need non-static priorities.* This request is considered under Requirement R5.2-A(1). This RR notes, in effect, that the appropriate priority of a task depends on what other tasks are executing on the same processor, and this might change during system development, maintenance, or run-time configuration, in which case, the language is too restrictive in requiring that priorities be specified with static expressions.
- RR-0655: *Add asynchronous message queues.* This request is considered under Requirement R5.4-A(1).
- RR-0656: *Need timed exceptions for deadline scheduling.* This request is considered under Requirement R5.1-C(1). The requirement should provide the requested functionality.
- RR-0657: *Order entry queues based on priority.* This request is considered under Requirement R5.2-A(1).
- RR-0658: *Allow accept statement possibility in a conditional entry call.* This request is considered under Requirement R5.2-A(2).
- RR-0659: *Need to make entry call on a generic formal parameter.* This request is considered under Study Topic S4.4-A(1).
- RR-0660: *Need constructors and destructors for package types.* This request is considered under Study Topic S4.2-A(2).
- RR-0661: *Need language features for assigning tasks to nodes.* This request is considered under Requirement R8.2-A(1).
- RR-0662: *Need package classes and inheritance for object-oriented programming.* This request is considered under Study Topic S4.3-B(1).
- RR-0663: *Allow certain overloading of := and subscripting.* This request is considered under Study Topic S4.2-A(2). User-defined subscripting is not required.
- RR-0664: *Need 'IMAGE' and 'VALUE' attributes for floating-point types.* This request is considered under Section A.3.1.
- RR-0665
This RR concerns three topics, each of which is treated separately. They are now listed.
- RR-0665A: *Support multicast message transfer.* This request is considered under Study Topic S5.4-B(1).
- RR-0665B: *Support allocation of parallel processes to processors.* This request is considered under Requirement R8.2-A(1).
- RR-0665C: *Support message-driven intertask communication.* This request is considered under Requirement R5.4-A(1).
- RR-0666: *Allow a subprogram body to be given by generic instantiation.* This request is considered under Section A.4.1.
- RR-0667: *Allow a subprogram body to be given by RENAMES.* This request is considered under Section A.4.1.
- RR-0668: *Need package types to get, for example, an array of packages.* This request is considered under Study Topic S4.3-B(1). The requirement provides much of the requested functionality.
- RR-0669: *Allow user-written := routines.* This request is considered under Study Topic S4.2-A(2).
- RR-0670: *Decouple = and /=; do not distinguish private from limited private.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0671: *Allow exceptions as generic parameters.* This request is considered under Study Topic S4.4-A(1).
- RR-0672: *Need anonymous pointer types.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0673: *Allow "END RECORD type name" to substitute for "END RECORD".* This request is considered under Section A.3.13.
- RR-0674: *Allow user-defined attributes as functions.* Rejected: insufficient user benefit (user-defined attributes). See Section 13.4.1.
- RR-0675: *Allow a subprogram identifier to be used as a type mark in its specification.* This request is considered under Section A.3.7.
- RR-0676: *Add finalization to ensure release of resources.* This request is considered under Study Topic S4.2-A(2).
- RR-0677: *Allow initialization clauses on scalar type declarations.* This request makes a useful suggestion for improvement in default initialization capabilities. See Section 2.2.2 of this document.
- RR-0678: *Pragma SHARED is not sufficient for data shared between programs; need VOLATILE.* This request is considered under Requirement R7.1-A(1).
- RR-0679: *Allow component selection on objects of a private type.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0680: *Predefined exponentiation should take any integer type for exponent.* Rejected: This change is difficult to make because of the overload resolution rules. This problem was considered extensively in the initial design, and all solutions posed difficulties to users. There are more important changes to focus on in this revision of Ada. See Section 13.1.
- RR-0681: *A definition of an Ada Line Of Code (LOC) should be standardized.* Rejected: not a language issue. See Section 13.7.

- RR-0682: *Allow user-defined overloaded operators such as "??", ":-", etc.* Rejected: too much implementor change for the payoff (user-defined operator syntax). See Section 13.5.1.
- RR-0683: *Section 11.6 of the Standard is unclear about what replacements are allowed.* This request is considered under Requirement R2.2-A(1).
- RR-0684: *Related packages need access to a private type's representation.* This request is considered under Study Topic S4.3-B(1).
- RR-0685: *Clarify and loosen 11.6 to allow more optimization.* This request is considered under Requirement R2.2-A(1).
- RR-0686: *Priority of interrupts higher than normal tasks is ill-conceived.* This request is considered under Requirement R6.3-A(1).
- RR-0687: *Pragma INLINE should not apply to all overloads; only closest.* This request makes a useful suggestion for improvement in controlling the effect of pragma INLINE. See Section 2.2.9 of this document.
- RR-0688: *Unnecessary recompilation required when redeclaring a subprogram body.* This request is considered under Study Topic S4.3-A(1). This RR gives an example where recompilation should not be required.
- RR-0689: *Optional bodies should not be unlinked without a warning.* This request is considered under Section A.2.4.
- RR-0690: *Allow incomplete and private types to be completed by subtype declaration.* This request is considered under Section A.4.2.
- RR-0691: *Allow machine-code insertions in functions as well as procedures.* Rejected: not desirable to ease machine code insertion. See Section 13.1.1.
- RR-0692: *Allow implementation-defined pragmas to cause unsuccessful compilation if restrictions implied by the pragmas are not obeyed.* This request is considered under Study Topic S2.3-A(1).
- RR-0693: *Parameter passing rules for scalars makes generic code sharing hard.* This request is considered under Requirement R2.2-A(1).
- RR-0694: *Need easy direct visibility to the equality operations.* This request is considered under Section A.2.3.
- RR-0695: *Allow EXIT from block for legibility.* Rejected: too difficult to distinguish exiting from a block inside a loop. See Section 13.1.2.
- RR-0696: *Pragmas LIST and PAGE should be optional.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0697: *Allow entry call alternative in selective wait.* This request is considered under Requirement R5.2-A(2). RR-0498 provides a rationale for this capability.
- RR-0698: *Need ability to separate portable and non-portable code into separate units.* This request is considered under Study Topic S4.3-B(1).
- RR-0699: *Do not treat an unaccepted length clause for a type as an error.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3.
- RR-0700: *Ensure that constant functions like sin(10.0) are evaluated at compile-time.* Rejected: It is too difficult to define what functions should be evaluated at compile-time. Moreover, the change would pose the potentially severe implementation burden of requiring a target machine function to be evaluated in the host machine environment. See Section 13.1.
- RR-0701: *Allow specification of STANDARD in the same way as for SYSTEM.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- RR-0702: *There is a need for improvements in heap storage management.* This request is considered under Requirement R4.2-A(1).
- RR-0703: *Need to specify STORAGE_SIZE on task objects, not task types.* This request is considered under Section A.3.5.
- RR-0704: *Make every bit available to the application programmer.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3.
- RR-0705: *For better performance, remove restrictions on static expressions.* This request is considered under Requirement R2.2-A(1). The RR provides a detailed analysis of approved AIs in terms of their possible effect on efficiency of both compilation and execution.
- RR-0706: *Allow exceptions and packages as generic parameters.* This request is considered under Study Topic S4.4-A(1).
- RR-0707: *Need same-name component identifiers in different variants.* This request makes a useful suggestion for improvement in variant record declarations. See Section 2.2.6 of this document. This RR gives a careful analysis of the unpleasant workarounds required today, but it is not clear that the implementation impact of this change would be acceptable.
- RR-0708: *Allow infix function calls.* Rejected: too much implementor change for the payoff. See Section 13.5.
- RR-0709: *Need more portability in getting command line inputs.* This request is considered under Requirement R2.4-A(1). See RR-0355 for specific suggestions.
- RR-0710: *Need to tie task entries to asynchronous external events generated by operating system.* This request is considered under Requirement R6.3-A(2).
- RR-0711: *I/O by a task in multi-task application should not block whole program.* This request is considered under Requirement R4.6-B(1).

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RR-0712: *Need ability to declare double precision numeric types within a generic unit.* This request is considered under Study Topic S4.4-A(1). The problem here is mainly the inability to create new numeric types whose precision is a function of a generic formal type. Relaxing the rules concerning static expressions would help in the creation of numerical library packages.

RR-0713: *Relax array matching rules for generics.* This request is considered under Study Topic S4.4-A(1).

RR-0714: *Allow default names for all generic formal parameters.* This request is considered under Section A.3.8. The RR gives a detailed example showing the problem caused by the inability to associate default names with generic formal types.

RR-0715: *Allow user-defined type conversions and attributes for numeric types.* This request is considered under Requirement R2.2-C(1). The ability to allow programmers to build user-defined types that have the same attributes and conversion notation as the predefined types is attractive as a generalization of the language's existing capability, but it is unclear whether such changes can be made without introducing anomalies.

RR-0716: *Unify and add attributes for numeric types.* This request is considered under Requirement R11.1-A(1). Many of the requested functions are being provided in packages currently being considered for ISO standardization.

RR-0717: *Allow specification of a step size in FOR loops.* This request makes a useful suggestion for improvement in iteration constructs. See Section 2.2.12 of this document.

RR-0718: *Need predictable results in numeric computation, especially regarding optimization.* This request is considered under Requirement R9.1-A(2). This RR gives an example of how optimization might cause difficulty in evaluating carefully constructed numerical expressions.

RR-0719: *Need standard for trig functions, sqrt, etc.* This request is considered under Requirement R11.1-A(1).

RR-0720: *Floating-point model should reflect actual hardware architectures.* This request is considered under Study Topic S11.1-B(1).

RR-0721: *Try to add unsigned integers to the language.* This request is considered under Requirement R6.1-A(1).

RR-0722: *Need generic formal record types.* This request is considered under Study Topic S4.4-A(1).

RR-0723: *Need support for reconfiguration in emergency cases.* This request is considered under Requirement R8.2-A(1).

RR-0724: *Need clearer/simpler overload resolution rules, especially for implicit conversion.* This request is considered under Requirement R2.1-

A(1). The problem mentioned here is addressed by AI-00136 and AI-00606.

RR-0725: *Need rename in package body for routine in package specification.* This request is considered under Section A.4.1.

RR-0726: *Need non-contiguous arrays, static pointers.* This request is considered under Requirement R6.4-A(1). The requirement supplies much of the requested functionality.

RR-0727: *Need selective direct visibility of package declarations.* This request is considered under Section A.2.3. The requirement reflects some of the requested functionality.

RR-0728: *Need simple Ada run-time system for distributed memory MIMD architectures.* This request is considered under Requirement R8.1-A(1). This RR asks for simplifications that reduce the size of the runtime system that must be supported on each node of a distributed system. No specific suggestions are made.

RR-0729: *Language should provide way to turn off optimization to eliminate bugs.* This request is considered under Requirement R9.1-A(2).

RR-0730: *The private part of a package should have its own context clause.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. Study Topic S4.3-B(1) may help to alleviate this problem.

RR-0731: *Use the Language Compatible Arithmetic Standard as a basis for Ada's floating point model.* This request is considered under Study Topic S11.1-B(1).

RR-0732: *Clarify semantics of instantiating ENUMERATION_IO with an integer type.* This request is considered under Requirement R2.4-A(1).

RR-0733: *Need fixed-point types not centered on zero.* Rejected: too much implementor change for the payoff. See Section 13.5.

RR-0734: *Generalize cases that allow implicit subtype conversion.* This request is considered under Section A.3.11.

RR-0735: *Need ability to change interrupt bindings at run-time.* This request is considered under Requirement R6.3-A(2).

RR-0736: *Need 8-bit ASCII in Ada.* This request is considered under Requirement R3.1-A(1).

RR-0737: *Allow reliable user control over selection of alternatives in a select statement.* This request is considered under Requirement R5.2-A(1). The RR explicitly notes that the 'COUNT attribute is not sufficient to ensure the requested degree of control.

RR-0738: *Add facilities to support vector processing hardware.* This request is considered under Study Topic S7.3-A(1). Although the requirement does not suggest that vector types and operands be added to the language, it does require that the revision address the needs of vector processing hardware.

- RR-0739: *Relax 11.6 canonical order rules to allow more optimization.* This request is considered under Requirement R2.2-A(1).
- RR-0740: *For optimization with respect to inlined subprograms, allow merging of scopes.* This request is considered under Requirement R2.2-A(1).
- RR-0741: *Need hot performance on vector machines; add vector types and operands.* This request is considered under Study Topic S7.3-A(1).
- RR-0742: *Need ability to asynchronously stop another task.* This request is considered under Requirement R5.3-A(1).
- RR-0743: *Need to allow increment of something other than one in for loops.* This request makes a useful suggestion for improvement in iteration constructs. See Section 2.2.12 of this document.
- RR-0744: *Allow for loop to have non-discrete (fixed-point) parameter.* This request makes a useful suggestion for improvement in iteration constructs. See Section 2.2.12 of this document.
- RR-0745: *Add facilities for dimensional mathematics to the language.* Rejected: too great a change from Ada 83 (dimensional mathematics). See Section 13.6.
- RR-0746: *Allow pictures/graphics as comments in source code.* Rejected: not a language issue. See Section 13.7. The environment should provide this functionality.
- RR-0747: *Provide better support for "light-weight" parallelism (as in Linda).* Rejected: too great a change from Ada 83. See Section 13.6. Although the LINDA model may be attractive, such a change of concept is outside the scope of the 9X revision effort.
- RR-0748: *Provide standard package of asynchronous primitives.* This request is considered under Requirement R5.4-A(1).
- RR-0749: *Should allow index sliding for slices serving as actual parameters and as values in record components.* This request is considered under Section A.3.11.
- RR-0750: *Add support for inheritance and polymorphism to the language.* This request is considered under Study Topic S4.3-B(1).
- RR-0751: *Add WHEN/RAISE construct to the language.* This request is considered under Section A.3.4.
- RR-0752: *Make various improvements to exception handling capabilities.* This RR duplicates the content of RR-0621; it is not discussed further.
- RR-0753: *Make syntax for task type declarations more consistent.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0754: *Require warnings for unrecognized pragmas.* This request is considered under Study Topic S2.3-A(1).
- RR-0755: *Allow "[" instead of "(" for indexed components.* This request makes a useful suggestion for improvement in the kinds of parenthesization allowed by the language. See Section 2.2.13 of this document.
- RR-0756: *Require warnings when pragmas are ignored.* This request is considered under Study Topic S2.3-A(1).
- RR-0757: *Clean up definitions of program unit and compilation unit.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2 A(2) of this document. This clarification may be worthwhile.
- RR-0758: *Bad paragraph numbering.* This request makes a useful suggestion for improvement in clarifying the wording of the standard. See Section 2.1-A(2) of this document.
- RR-0759: *Add real-time and verification facilities for control engineering.* Rejected: insufficient information in the RR to evaluate properly. See Section 13.3.
- RR-0760: *Like non-generic subprograms, allow merge of specification/body for generic ones.* This RR duplicates the content of RR-0547; it is not discussed further.
- RR-0761: *Allow subprogram bodies to be defined by RENAMES or generic instantiation.* This RR duplicates the content of RR-0550; it is not discussed further.
- RR-0762: *Need assignment capability for TEXT_IO.FILE_TYPE.* This RR duplicates the content of RR-0551; it is not discussed further.
- RR-0763: *Allow nested scopes to turn off pragma SUPPRESS.* This request is considered under Requirement R2.3-A(2). Enforcing conventions for the correct use of pragma SUPPRESS can be important. The best solution, however, is not necessarily a pragma that turns off the effect of the pragma in a nested scope.
- RR-0764: *Allow subprogram bodies to be defined by RENAMES.* This request is considered under Section A.4.1. This RR argues that the workaround needed when a subprogram body can't be provided by a renaming declaration increases recompilation requirements.
- RR-0765: *Allow "when Package Name.others =>" as exception handler.* Rejected: This change could introduce serious problems during maintenance. See Section 13.1.
- RR-0766: *Allow bit-wise operations (AND, SHIFT) on integers, bytes, etc.* This request is considered under Requirement R6.1-A(1).
- RR-0767: *Solve the elaboration order problem without requiring the use of pragma ELABORATE.* This request is considered under Section A.2.1.
- RR-0768: *Need to asynchronously interrupt another task to stop it.* This request is considered under Requirement R5.3-A(1).

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- RR-0769: *Correct wording in the definition of ancestor unit.* This request is considered under Requirement R2.1-A(1). See AI-00482.
- RR-0770: *Make aborting yourself cause instant completeness.* Rejected: not a language issue. See Section 13.7. It is arguable that 9.10(6) requires immediate completion of a task that aborts itself.
- RR-0771: *Require tasks to have an accept for each entry.* This request is considered under Requirement R9.3-A(1). Requiring at least one accept statement for each entry may be a reasonable project coding convention that should be enforceable by compilers.
- RR-0772: *Need to be able to get exception name in a handler.* This request is considered under Requirement R4.5-A(1).
- RR-0773: *Need to pack variable-length records into a block for data transmission.* This request is considered under Requirement R6.2-A(1).
- RR-0774
This RR concerns many topics, each of which is treated separately. They are now listed.
- RR-0774A: *Make it possible to write NEW in Ada.* This request is considered under Requirement R4.2-A(1).
- RR-0774B: *Tasking defined as a standard package of functions.* Rejected: too great a change from Ada 83. See Section 13.6.
- RR-0774C: *Extend control of library unit visibility.* This request is considered under Study Topic S4.3-C(1).
- RR-0774D: *Allow overloaded names in the library.* Rejected: Although it may seem more uniform to allow library unit names to be overloaded, a with clause naming such a unit would be unresolvably ambiguous. See Section 13.1.
- RR-0774E: *Provide access to context of an exception situation.* This request is considered under Requirement R4.5-A(1). The requirement allows additional information to be made available if this can be done with little implementation cost.
- RR-0774F: *Allow aliased exceptions within the same exception handler.* This request is considered under Requirement R2.2-B(1). It seems that it would be both useful and harmless to allow both P1.END_ERROR and P2.END_ERROR as exception choices in a single exception handler when both exceptions denote IO_EXCEPTIONS.END_ERROR.
- RR-0774G: *Provide exception name in OTHERS handler.* This request is considered under Requirement R4.5-A(1).
- RR-0774H: *Provide more predefined exception names with finer granularity.* Rejected: insufficient user benefit (grouping exceptions). See Section 4.5-A(1). This issue was given thorough consideration in the original design, and insufficient evidence is given in this RR to justify reconsidering the decision.
- RR-0774I: *Create separate standards, such as X-Windows, SQL.* Rejected: The creation of separate standards is outside the scope of the Ada 9X revision effort. See Section 13.1.
- RR-0774J: *Allow generic parameters for any Ada entity, e.g., exceptions.* This request is considered under Study Topic S4.4-A(1).
- RR-0774K: *Allow subprograms as parameters.* This request is considered under Requirement R4.1-B(1).
- RR-0774L: *Allow pragma INTERFACE within a package body.* Rejected: The compiler needs this information before a package body is compiled in order to minimize the need for recompilation. See Section 13.1.
- RR-0774M: *Allow a subprogram to be renamed in a body.* Rejected: Since a renaming declaration already is allowed in a body, the intent behind this request is unclear. See Section 13.1.
- RR-0774N: *Allow task cleanup on termination of parent.* This request is considered under Study Topic S4.2-A(2). Finalization is one of the matters to be studied.

Appendix B: Numerical Listing of AIs

Comments on Ada 83 that were submitted in response to the Postscript in the Standard and that suggested changes to the language were given Ada Commentary numbers and classified as "study" commentaries. These are listed below with an indication of how they affected the requirements. Study commentaries are underlined when they contain examples or discussion that may be especially helpful to the Mapping/Revision Team or when reviewing proposed changes to the language.

AI-00003: *Allow data of mode IN in SEND CONTROL.* Rejected: There is no requirement to fix the low-level I/O programming capabilities in the language. Other needs are more important. See Section 13.1.

AI-00140: *Allow -1..10 as a discrete range in loops.* This request is considered under Section A.3.12.

AI-00142: *Allow pragma SHARED to be applied to components of composite objects.* This request is considered under Requirement R7.1-A(1).

AI-00211: *Additional control statement to hop to end of the loop.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.

AI-00214: *Allow accept statements in program units nested in tasks.* This request makes a useful suggestion for improvement in the ability to modularize code in task bodies. See Section 2.2.7 of this document. This AI provides another example in the spirit of RR-0543.

AI-00216: *Provide standard methods for testing whether characters are numeric, upper case, lower case, control, etc., independent of character representation.* This request is considered under Study Topic S10.2-A(1). This AI requests that such tests be specifiable in a uniform manner, regardless of the representation for a character set.

AI-00223: *Require adequate resolution for the function CLOCK.* This request is considered under Requirement R5.1-A(1).

AI-00262: *Real literals with fixed point multiplication and division.* This request makes a useful suggestion for improvement in the ability to use real literals in fixed point expressions. See Section 2.2.8 of this document. This AI makes the same suggestion as RR-0591.

AI-00274: *Proposed extension of the USE clause — record component visibility.* Rejected: Introducing a Pascal-like use clause for records might be convenient, but it is not necessarily straightforward to ensure that all components of the record maintain their existence throughout the scope of the use clause. There are more important requirements to be addressed. See Section 13.1.

AI-00280: *Allow pragma OPTIMIZE in package specifications.* This request is considered under Requirement R2.2-C(1).

AI-00285: *Need to be able to access a base numeric type in some algorithms.* This request is considered under Study Topic S4.4-A(1). This AI gives an example of the difficulties of getting access to a numeric base type, which was needed when trying to write TEXT_IO.FIXED_IO in Ada.

AI-00291: *Can't define a generic package that works for all floating point types.* This request is considered under Study Topic S4.4-A(1).

AI-00327: *Instantiating with an incomplete private type.* This request makes a useful suggestion for improvement in the ability to use private types before their full declaration. See Section 2.2.5 of this document. This AI is similar to RR-0542, but contains more detail.

AI-00329: *Look-ahead operation for TEXT_IO.* This request is considered under Requirement R4.6-B(1).

AI-00345: *Record type with variant having no discriminants.* This request is considered under Requirement R4.6-B(1). The principle requested use for untagged variants is for I/O.

AI-00349: *Delete copy-in/copy-back for scalar and access parameters.* This AI is the same as RR-0693.

AI-00378: *Enumeration literals should be made directly visible by a subtype declaration.* This request is considered under Section A.2.3.

AI-00382: *Allow generic subprogram bodies.* This request is considered under Requirement R2.2-B(1).

AI-00390: *Character literals should be made directly visible by a subtype declaration.* This request is considered under Section A.2.3.

AI-00404: *Use of incomplete private types in generic formal part.* This request is considered under Requirement R2.2-C(1). This AI illustrates an unintended annoying consequence of the rule restricting the use of an incomplete private type.

AI-00420: *Allow 256 values for type CHARACTER.* This request is considered under Requirement R3.1-A(1).

AI-00421: *Eliminate pragma ELABORATE.* This request is considered under Section A.2.1. This AI explains the dangers in the current definition of pragma ELABORATE.

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- AI-00427: *Semi-constrained subtypes*. Rejected: not a language issue. See Section 13.7. This comment reflects a misunderstanding of the language.
- AI-00429: *Allow array type definition for record component*. Rejected: insufficient user benefit (anonymous arrays as record components). See Section 13.4.4. LSN-222 discusses the potential complexity of allowing this capability. See Language Study Notes, 1983, available from the Ada Information Clearinghouse.
- AI-00442: *Time zone information in package CALENDAR*. Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. It is not clear that time zone information is of sufficient general use to warrant a change to the language.
- AI-00450: *Should allow raising of an exception in another task*. This request is considered under Requirement R5.3-A(1). A different solution is called for.
- AI-00451: *Task entries as formal parameters to generics*. This request is considered under Study Topic S4.4-A(1). This AI discusses some workarounds that are needed if entries are not distinguished as generic formal parameters.
- AI-00452: *Allow record types as generic formal parameters*. This request is considered under Study Topic S4.4-A(1).
- AI-00453: *STORAGE_SIZE for tasks*. This request is considered under Section A.3.5.
- AI-00458: *Problem with naming of subunits*. This request is considered under Study Topic S4.3-C(1).
- AI-00460: *Allow non-integral powers for exponentiation*. Rejected: This change is difficult to make because of the overload resolution rules. This problem was considered extensively in the initial design, and all solutions posed difficulties to users. There are more important changes to focus on in this revision of Ada. See Section 13.1.
- AI-00473: *Any form of actual parameter should be allowed as a default parameter*. This request makes a useful suggestion for improvement in the treatment of subprogram parameters. See Section 2.2.3 of this document. This AI points out an easily fixed inconsistency in the language.
- AI-00477: *Case choices should not have to be static*. Rejected: too much implementor change for the payoff (non-static case labels). See Section 13.5.2.
- AI-00478: *Allow reading of OUT formal parameters*. This request is considered under Section A.3.10. This AI points out that if a formal out parameter is used as an actual out parameter in a call, it is quite natural to want to read the returned value before returning from a call.
- AI-00479: *Initialize access type OUT parameters to null*. This request is considered under Section A.3.10. This AI is essentially the same as RR-0559.
- AI-00480: *Operators should be made directly visible by a subtype declaration*. This request is considered under Section A.2.3.
- AI-00485: *Having independent standard input and output files is not useful for interactive I/O*. This request is considered under Requirement R4.6-A(1).
- AI-00487: *END_OF_PAGE and END_OF_FILE should not return TRUE when there is still an empty line to be read*. This request is considered under Requirement R4.6-B(1).
- AI-00488: *Skipping of leading line terminators in GET routines causes problems in interactive I/O*. This request is considered under Requirement R4.6-A(1).
- AI-00510: *Use ISO symbols and standards in the Ada ISO Standard*. This request is considered under User Need U3.1-A. This commentary also requests that national alphabets be usable in identifiers, character literals, string literals, and comments. All of these requests are addressed by Requirements R3.1-A(1-5).
- AI-00518: *Fixed and floating type declarations needlessly different*. Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- AI-00519: *Default SMALL should be a power of two times the range*. This request is considered under Requirement R2.2-C(1). This request reflects the need for fixed point types with maximum accuracy for the specified range. This need is in conflict with the Information Systems need for maximum range with only the specified accuracy.
- AI-00521: *Fixed point subtypes should not inherit SMALL*. Rejected: insufficient information in the RR to evaluate properly. See Section 13.3. The submitted comment does not give enough motivation for the suggested change to understand why a change might be useful.
- AI-00526: *Rounding up or down*. This request is considered under Requirement R2.4-A(1).
- AI-00529: *Resolving the meaning of an attribute name*. Rejected: The rules for resolving the overloading of an attribute prefix were adopted after considerable review of complex cases. The example given in this AI does not suggest that there is sufficient user need to reconsider this complicated area of the language. See Section 13.1.
- AI-00538: *Declaring constant arrays with an anonymous type*. Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.

- AI-00539: *Allow use of array/record attributes in representation clauses.* This request makes a useful suggestion for improvement in the ability to use representation attributes. See Section 2.2.4 of this document.
- AI-00540: *Completing a private type declaration with a subtype declaration.* This request is considered under Section A.4.2.
- AI-00544: *File "append" capability proposed.* This AI is the same as RR-0405.
- AI-00545: *Procedure to find if a file exists.* This AI is the same as RR-0404.
- AI-00570: *Releasing heap storage associated with task type instances.* This request is considered under Section A.1.1. Implementations would find it easier to return unused storage if tasks could not exist outside their masters.
- AI-00572: *Unique path name for subunits.* This AI is the same as RR-0402.
- AI-00582: *Need a standard name for null address.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- AI-00584: *Restrict argument of RANGE attribute in Ada 9x.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4. The example motivating the change is only one of several ways to write implementation-dependent programs and does not justify the proposed language change.
- AI-00595: *Name of the current exception.* This AI is the same as RR-0403.
- AI-00600: *Why we need unsigned integers in Ada.* This request is considered under Requirement R6.1-A(1).
- AI-00605: *GET_LINE skips terminators at the end of the line, which is inconsistent with other GET procedures.* This request is considered under Requirement R4.6-B(1).
- AI-00609: *Floating point machine attributes inadequate to fully characterize machine characteristics.* This request is considered under Study Topic S11.1-B(1).
- AI-00681: *Can't declare a constant of a NULL record type.* Rejected: insufficient user benefit to justify disturbing the language. See Section 13.4.
- AI-00812: *Attributes SAFE_LARGE and SAFE_SMALL should be static.* This request is considered under Requirement R2.2-C(1).
- AI-00832: *Effect of depending on parameter passing method when calling non-Ada programs.* This request is considered under Requirement R2.3-A(2).
- AI-00840: *Allow access OUT parameter as attribute prefix.* This request makes a useful suggestion for improvement in the treatment of subprogram parameters. See Section 2.2.3 of this document. This AI points out an unneeded and overly restrictive rule.
- AI-00850: *Rejecting a unit when a pragma's assumptions are not met.* This request is considered under Study Topic S2.3-A(1). This AI is being actively considered by the Ada Rapporteur Group.
- AI-00851: *Need easy direct visibility to the equality operations.* This AI is the same as RR-0694.
- AI-00852: *Exiting blocks.* This AI is the same as RR-0695.
- AI-00853: *Pragma INLINE should not apply to all overloads.* This AI is the same as RR-0687.
- AI-00854: *Related packages need access to a private type's representation.* This AI is the same as RR-0684.
- AI-00855: *Limit recompilation effect when compiling a subprogram body as a library unit.* This AI is the same as RR-0688.
- AI-00856: *Optional bodies should not be unlinked without a warning.* This AI is the same as RR-0689.
- AI-00857: *Priorities of interrupts.* This AI is the same as RR-0686.
- AI-00858: *Functions implemented in machine code.* This AI is the same as RR-0691.
- AI-00859: *Pragmas LIST and PAGE should be optional.* This AI is the same as RR-0696.
- AI-00873: *Type conversion/qualification of undefined scalar values.* This request is considered under Requirement R2.3-A(2). The AI suggests a simple upward-compatible rule change that is consistent with the intent of the Requirement.
- AI-00874: *Ensure that access values are values of 'ADDRESS.* This request is considered under Requirement R6.4-A(1).

Appendix C: Included Documents

C.1 Why Static Expressions Can't Contain Explicit Conversions

The Ada 83 restriction that forbids explicit conversions in static expressions stems from a comment submitted during the development of Ada. This comment is reproduced below since these comments are not easily accessible to most people.

!section 04.09 (10) Gary Dismukes/TeleSoft 82-10-11

#4709.

!version 16

!class Amendment: Resolution

!topic May rounding be nondeterministic?

For conversions from real values to integer values it is stated that "if the operand is halfway between two integers rounding may be either up or down." This suggests that the rounding operation may vary from evaluation to evaluation, even for the same operand. Given that this is true, and given that such conversions may appear within static expressions it appears that the following examples may (or may not) be legal:

Example 1:

```
type SMALL_1 is range 1 .. 1;
S : SMALL_1;
case S is
  when SMALL_1( 1.5 ) => null;
end case;
```

Example 2:

```
type SMALL_2 is range 1 .. 2;
S : SMALL_2;
case S is
  when SMALL_2( 1.5 ) => null;
  when SMALL_2( 1.5 ) => null;
end case;
```

In the first example, the case choice may be legal or illegal depending on how the compiler evaluates the static conversion. In the second example the statement may or may not be legal depending on whether the compiler evaluates the conversions as being equal or as being 1 and 2. In this case, even if the statement is accepted it is nondeterministic as to which case alternative is executed. Note that the legality of these examples may be nondeterministic even for recompilation on the same implementation.

RESPONSE: Yes, rounding may be nondeterministic.

The legality of a case statement can depend on the implementation in other ways (e.g. by using FLOAT DIGITS).

The problems of nondeterminism is serious enough to justify the removal of conversions from static expressions.

C.2 Restriction on Negative Literals

The restriction forbidding the use of negative literals in certain contexts such as for I in -1 .. 10 loop stems from the following comment submitted during the Ada 83 design.

!section 03.06.01 (02) D Taffs 82-08-30

#3705.

!version 16

!class Amendment: Resolution

!topic Implicit conversions of universal discrete ranges

The wording of the first sentence of this paragraph is unclear, and I think it does not mean what it says. I suggest replacing this sentence with:

For a discrete range used in a constrained array definition and defined by a range, if BOTH bounds of the range are (potentially) values of the type universal integer, then the predefined type INTEGER is used for the type of each bound.

The current wording says an EXPRESSION defining a bound is implicitly converted. It is not at all clear what happens when an EXPRESSION is implicitly converted, as 4.6 only defines implicit conversion for certain primaries. Note that implicit conversion is not listed among the references for 3.6.1, although "conversion" and "subtype conversion" are. I believe that the intent of 3.6.1(2) is that the BOUNDS of the RANGE be predefined INTEGER, rather than applying an implicit conversion to predefined INTEGER and using whatever type results. For example, in the following example, I think the index range should be of type INTEGER, using the first "+" (and implicitly converting 2 to MY_INT). The range should not be MY_INT, using the third "+" (if only the 2's are implicitly converted) or INTEGER, using universal_integer "+" (if the expression is implicitly converted, as the current wording suggests):

```
type MY_INT is range ... ;
function "+" (R : MY_INT) return INTEGER;
function "+" (X : INTEGER) return INTEGER;    -- hides INTEGER "+"
function "+" (R : INTEGER) return MY_INT;
...
Q : array ("+"(R=>2) .. "+"(R=>2)) of ...
```

If my interpretation is correct, then in some cases (as above) no implicit conversion to INTEGER need be applied at all (the above example converts both 2's to MY_INT, in order to define the range as INTEGER). Therefore, the wording must be changed (as above) to provide a particular context, rather than apply a particular implicit conversion. The current wording makes no sense at all for the above example.

Also, it is not clear whether that sentence applies if EITHER bound is universal integer, or if BOTH bounds are universal integer. This should be made clearer, by saying "if BOTH bounds of the range" in the sentence.

RESPONSE: *The intent of this feature is to cover cases such as*

```
array(1 .. 10);
```

We should keep it simple. For this reason we will restrict the feature to

- integer literals
- named numbers

C: Included Documents

- *attributes*

(see version 19)

COMMENT 03.06.01 (02) D Taffs 83-01-02 #5435.

!version 21

!class Amendment: No Action

!topic array (-1..1) is now illegal (see #3705)

.. since -1 is not a numeric literal. The drastic solution taken here is unnecessary, since the response to #3705 assumed that two overloading resolution passes would be required, but this is not the case. Allowing the 1 in -1 to be implicitly converted to INTEGER in the above example is no more complex than allowing -1 to be converted for

array (-1..A+B)

where A+B resolves to type INTEGER. The suggested wording in 3705 was only intended to say that if both bounds are of type universal integer before implicit conversions are applied, then each bound is to be considered to occur in a context requiring an INTEGER expression. The downward pass in overloading resolution will then select the correct implicit conversions. Taking this approach seems preferable to ruling out bounds that are negative integer literals (requiring named numbers in this case).

RESPONSE: Arrays with negative literal bounds are very rare, and, in our opinion, not worth complicating the rules.

Implicit conversions and overload resolutions are interweaved, so that the phrase "are of type universal_integer before implicit conversions" has little meaning in the general case: subexpressions of a universal expression may require implicit conversions (such as

BOOLEAN' POS (F = 1) or, simpler 23).**

Appendix D: KWIC Listing of RR and AI Titles

This Appendix contains a KWIC (KeyWord In Context) Index to the titles of the Revision Requests and the AIs. An individual entry is structured as follows:

<i>RR-xxxx</i>	<i>Sec</i>	<i>Tail</i>	<i>Before</i>	<i>Keyword</i>	<i>Head</i>
RR-0049	13.4		notation when the same name is on both sides of	=	Allow special
RR-0541	4.2		Allow user-defined	:=, =, DESTROY	operations to support memory mgmnt
RR-0682	13.5.1		Allow user-defined overloaded operators such as	"?", ":", etc	
RR-0534	2.2.13		Allow brackets other than	"(", ")"	in aggregates, etc
RR-0663	4.2		Allow certain overloading of	:=	and subscripting
RR-0765	13.1		Allow "when Package_Name.others"	=>	as exception handler
RR-0392	13.5		Need "semi-limited" type with predefined	:=	but no predefined =
RR-0682	13.5.1		Allow user-defined overloaded operators such as	"?", ":", etc	
RR-0413	4.2		Allow user-written	:=	for all types
RR-0755	2.2.13		Allow "[" instead of	"("	for indexed components
RR-0534	2.2.13		Allow brackets other than "(")"	in aggregates, etc
RR-0755	2.2.13		Allow	"["	instead of "(" for indexed components
RR-0609	4.2		Allow user-defined override of =, /=	:=	on all types
RR-0669	4.2		Allow user-written	:=	routines
RR-0011	13.6		Expression	0**0	should not be 1 as this is an indeterminate form
RR-0700	13.1		Ensure that constant functions like sin(10.0)	are evaluated at compile-time
AI-00140	12.3.12		Allow -	1..10	as a discrete range in loops
RR-0739	2.2		Relax	11.6	canonical order rules to allow more optimization
RR-0683	2.2	replacements are allowed	Section	11.6	of the Standard is unclear about what
RR-0387	2.2	more optimizing	Relax	11.6	optimization rules to allow compiler to do
RR-0685	2.2		Clarify and loosen	11.6	to allow more optimization
RR-0130	4.6		Replace DEFAULT_xy variables in Chapter	14	by functions
RR-0294	met		for embedded applications; make Chapter	14	optional
RR-0134	13.6		Require re-evaluation of entry count on		I/O packages are not suitable
RR-0335	5.3		Effect of	abandoned	entries
RR-0063	5.3		Protect tasks from being	abort	statement is too implementation-dependent
RR-0770	13.7		Make	aborting	yourself cause instant completeness
RR-0166	13.3		Allow definition of the literal representations of an	abstract	data type
RR-0167	4.3		Allow classes of	abstract	data types
RR-0217	13.1		Require that a parameter of an entry be used within an	accept	
RR-0771	9.3		Require tasks to have an	accept	for each entry
RR-0216	9.3		Require that each task entry have at least one	accept	statement
RR-0658	5.2	entry call	Allow	accept	statement possibility in a conditional
RR-0499	12.3.2		Like other "blocks", allow exception handlers in	accept	statements
RR-0498	5.2		Make selective wait symmetrical with respect to	accept	statements and entry calls
AI-00214	2.2.7		Allow	accept	statements in program units nested in tasks
RR-0543	2.2.7		Allow	accept	statements in subprograms nested inside tasks
RR-0580	2.2.7	inside tasks	Allow	accepts	within subprograms/packages nested
AI-00285	4.4		Need to be able to	access	a base numeric type in some algorithms
RR-0560	4.3	related packages	Need to	access	a private type's representation in
RR-0261	2.3		Need compile-time warnings for	access	before elaboration errors
RR-0640	6.1		Need to	access	chunk of a bit vector as a whole
RR-0039	11.2		Make it easier to	access	FORTTRAN libraries
RR-0098	13.4		Generalize incomplete typing for types other than	access	or private
AI-00840	2.2.3		Allow	access	OUT parameter as attribute prefix
RR-0684	4.3		Related packages need	access	to a private type's representation
RR-0104	12.1.1		Prohibit	access	to a task outside its master
RR-0774E	4.5		Provide	access	to context of an exception situation
RR-0110	6.4		Provide explicit control over placement of and	access	to data in different types or regions of/
RR-0286B	5.2	run-time system	Embedded system user may need	access	to interrupts that are also used by the
RR-0559	13.6		If allow reading of OUT parameters, initialize OUT	access	to NULL
AI-00479	12.3.10		Initialize	access	type OUT parameters to null
RR-0197	13.6	designated object cannot be modified	For	access	types, parameter mode IN should mean the

RR-0287	2.4		Make	access types point directly to designated object
RR-0338	6.4			access values
AI-00874	6.4	and safe conversion between ADDRESS values and		/pointers to static objects
RR-0258	6.4		Ensure that	access values are values of 'ADDRESS
RR-0238	6.4		Need	access values that point to declared objects
RR-0293	6.4		Allow	access values to designate read-only memory
RR-0247	13.6		Allow	access values to point to declared objects
RR-0276	5.1		Don't initialize	access variables by default to NULL
RR-0225	11.1		Need user specified	accuracy and precision control over timing
RR-0401	2.2	Ensure floating point representation with desired		accuracy is used
RR-0352	5.1	cannot be done efficiently because of		accuracy requirements
RR-0068	2.4	Require Calendar.Clock to return consistently		accurate local system time
RR-0647	4.1	The Standard should explicitly		acknowledge that I/O support is optional for embedded/
RR-0013	2.1	Need ability to select		actions depending on state without using case statements
RR-0497	13.7	task execution	Allow task	activation to occur at a higher priority than
RR-0720	11.1	/default discriminants for types used as generic		actual can yield a surprising run-time error
RR-0252E	11.1	Floating-point model should reflect		actual hardware architectures
RR-0169	13.4	Provide a floating point model that reflects		actual machine architecture
AI-00473	2.2.3	Allow "null" procedures for		actual or default generic formal subprogram values
RR-0239B	2.2.3	Any form of		actual parameter should be allowed as a default parameter
RR-0749	12.3.11	A renamed type cannot be used in an		actual parameter type conversion
RR-0586	4.4	/allow index sliding for slices serving as		actual parameters and as values in record/
RR-0549	4.4	/of the same generic unit may have to evaluate their		actual parameters in different orders
AI-00582	13.4	Ensure the use of unconstrained		actual types is always legal
AI-00874	6.4	Need a standard name for null		address
RR-0302	2.4	Ensure that access values are values of '		ADDRESS
RR-0388	4.1	should define literals for values of type		ADDRESS
RR-0291	6.4	Proposal for clean way of executing a subprogram by its		The language
RR-0114	6.3	Clarify whether use of an		address
RR-0374	4.2	just on the type	Allow an	address clause causes storage to be initialized
RR-0086	13.4	distributed systems	Ada should	address clause for each task instance, and not
RR-0195	6.3	Need to initialize a record component to the		address memory management requirements in
RR-0421B	6.3		Need interrupt	address of the record itself
RR-0338	6.4	memory address structure; a single/	Interrupt	address per task, not task type
RR-0349	6.3	/pointers to static objects and safe conversion between		address structure is sometimes different from
AI-00223	5.1	different and should not be treated/	Interrupt	ADDRESS values and access values
RR-0105	5.1		Require	addresses and memory addresses are conceptually
RR-0198	13.4		Allow application to set/	adequate resolution for the function CLOCK
RR-0571B	2.1		Allow positional	adjust clocks
RR-0341	2.2	Clarify the effect when the choice in an		aggregate for single-component aggregate
RR-0391	13.4	Allow discriminant value in record		aggregate is outside the range of the/
RR-0573	12.3.11	Clumsy syntax for based numbers, especially in		aggregate to be non-static
RR-0240	12.3.11	initialization and as components of record		aggregates
RR-0605	12.2.5	Non-sliding		aggregates
RR-0534	2.2.13	Rules for OTHERS in		/aggregates for record component
RR-0053	13.4	Allow brackets other than "(", ")" in		aggregates and slices in component associations
RR-0573	12.3.11	Slide indices of array		aggregates are confusing
AI-00329	4.6	Look-		aggregates, etc
RR-0774F	2.2	Allow		aggregates for null records and arrays
RR-0463	13.4	'Size is unclear; perhaps need 'Spacing and '		aggregates for record component initialization
RR-0417	6.2	Length clause should force		ahead operation for TEXT_IO
RR-0665B	8.2	Support		aliased exceptions within the same exception handler
RR-0176	9.1	Document run-time system performance and memory		Allocation
RR-0370E	4.2	control blocks when tasks are created by an		allocation of EXACT number of bits
RR-0107	5.1	to specify clock timing interval if hardware		allocation of parallel processes to processors
RR-0339	13.1	Support sorting in extended		allocation strategies
RR-0549	4.4	Ensure the use of unconstrained actual types is		allocator
RR-0626	6.2	/by SEQUENTIAL_IO and DIRECT_IO are not portable		Need to recover space for task
RR-0521	5.2	convenient support for use of shared memory		allows this flexibility
RR-0041	4.3	Allow overloaded subunits with respect to a common		Allow application
RR-0769	2.1	Correct wording in the definition of		alphabets
RR-0321	13.4	record components	Permit	always legal
RR-0617	13.6		Eliminate	among compilers, even for the same target/
RR-0443	13.4.4		Need for	among tasks
RR-0672	13.4		Need	Need more
AI-00538	13.4	Declaring constant arrays with an		anonymous array and record declarations for
RR-0345	13.1	Need standardized interface to other		anonymous array types
RR-0420	4.6	Need file "extend" or		anonymous array types as record components
				anonymous pointer types
				anonymous type
				ANSI languages
				"append" capability

RR-0207	4.6	Add TEXT_IO support with Exists function and	Append procedure
RR-0405	4.6	Need convenient way to	append to a file
RR-0382	4.6	Need to be able to rename and	append to a file in standard Ada
AI-00142	7.1	Allow pragma SHARED to be	applied to components of composite objects
RR-0581B	2.1	no body	applying pragma ELABORATE to a package that has
RR-0252E	11.1	point model that reflects actual machine	architecture
AI-00584	13.4	Restrict	argument of RANGE attribute in Ada 9x
RR-0355	2.4	Standardize means of getting the OS command line	arguments
RR-0635	13.4	Provide basic support for extended precision integer	arithmetic
RR-0144	13.3	not present	arithmetic even if floating point hardware is
RR-0634	6.1	Require support for fixed point	arithmetic shift operations for integers
RR-0731	11.1	floating point/	Arithmetic Standard as a basis for Ada's
RR-0557	4.3	Use the Language Compatible	around the inability to overload subunit names
RR-0334	7.2	/to provide subprogram bodies helps get	array
RR-0573	12.3.11	initialization and as/	its work domain, e.g., to process part of an
RR-0321	13.4	Slide indices of	array aggregates for record component
RR-0336	13.4.4	Permit anonymous	array and record declarations for record components
RR-0122	2.2	type definitions in records; nice for array-of-	array case
RR-0713	4.4	implementation to reject some integer types as	array indexes
RR-0668	4.3	Relax	array matching rules for generics
RR-0017	6.2	Need package types to get, for example, an	array of packages
RR-0308	11.1	Be able to treat an Ada object as an	array of storage units
RR-0251	13.6	Add libraries for	array processing
RR-0133	7.2	Invent new notations to distinguish function call,	array reference, and conversions
RR-0513	12.3.9	Allow a task component of an	array to get its index
AI-00429	13.4.4	of = for any type, e.g., returning an	array type
RR-0336	13.4.4	array-of-array case	array type definition for record component
RR-0617	13.6	Allow	array type definitions in records; nice for
RR-0443	13.4.4	Eliminate anonymous	array types
RR-0418	2.2	Need for anonymous	array types as record components
RR-0336	13.4.4	Representation clauses for	array types need to be added
AI-00539	2.2.4	Allow array type definitions in records; nice for	array-of-array case
RR-0053	13.4	Allow use of	array/record attributes in representation clauses
RR-0139	6.1	Allow aggregates for null records and	arrays
RR-0323	13.4.2	Provide shift and rotate operations for boolean	arrays
RR-0494	13.4.2	Generalize slice for multidimensional	arrays
RR-0508	13.4.2	Allow slices for any dimension in multidimensional	arrays
RR-0520	13.1	Language should distinguish "sequence" and "mapping"	arrays
RR-0257	2.1	Ensure that BOOLEAN and BYTE	arrays can be tightly packed
RR-0426C	13.6	Omitting index constraint in constant	arrays causes programmer errors
RR-0726	6.4	Need non-contiguous	arrays, static pointers
RR-0510	2.2.10	Re-indexing	arrays via type conversions
AI-00538	13.4	Declaring constant	arrays with an anonymous type
RR-0018	6.4	Need pre-elaborated constant	arrays with variable-sized elements
RR-0619	2.2	Eliminate three replacement characters, stick to normal	ASCII
RR-0736	3.1	Need 8-bit	ASCII in Ada
RR-0148	3.1	for extended and graphic characters (256	ASCII set)
RR-0043	13.1.1	Make it easier and more portable to use	assembler with Ada
RR-0088	4.2	Problems associated with user-defined	assignment
RR-0551	4.6	Need	assignment capability for TEXT_IO.FILE_TYPE
RR-0001	4.2	Limited types need	assignment, constants
RR-0070	4.2	Allow user-defined	assignment for limited types
RR-0160	4.2	Allow user-defined	assignment for limited types
RR-0201B	4.2	Overload the	assignment operation
RR-0202	4.2	mode rules for limited types that have an	assignment operation
RR-0163	10.4	strings with appropriate equality and	assignment operations
RR-0184	4.2	Need user-defined	assignment operator for limited private type
RR-0212	13.6	Allow	assignment to record discriminant like other components
RR-0310	10.4	Need convenient way to pad with blanks in string	assignments
RR-0421C	6.3	objects, not task types	associate interrupts with entries of task
RR-0240	12.3.11	Non-sliding aggregates and slices in component	associations
RR-0571A	12.2.5	Allow use of OTHERS choice with named	associations when index bounds are determined by/
RR-0029	12.2.5	determined by/	associations when the index constraint is
AI-00850	2.3	Allow use of OTHERS with named	assumptions are not met
RR-0710	6.3	Rejecting a unit when a pragma's	asynchronous external events generated by
RR-0183	5.4	operating system	Asynchronous inter-task communication is not available
RR-0655	5.4	Need to tie task entries to	asynchronous message queues
RR-0748	5.4	Add	asynchronous primitives
		Provide standard package of	

RR-0106	5.3		Provide	asynchronous transfer of control
RR-0083	5.3	call/selective wait construct	Provide	asynchronous transfer of control via entry
RR-0768	5.3		Need to	asynchronously interrupt another task to stop it
RR-0742	5.3		Need ability to	asynchronously stop another task
RR-0434	7.1		Need	atomic read/write operations on shared volatile memory
RR-0623	12.3.3		Define RANGE	attribute for discrete ranges
RR-0495	13.6	Remove leading space in the result of the 'IMAGE		attribute for integers
RR-0454	11.1		Need Entire function or	attribute for real types
RR-0059	2.2.14	underlying value	Need an	attribute for returning a representation's
RR-0155	12.3.3		Define RANGE	attribute for scalar types
RR-0304	12.3.3		Define RANGE	attribute for scalar types
AI-00584	13.4		Restrict argument of RANGE	attribute in Ada 9x
AI-00529	13.1		Resolving the meaning of an	attribute name
AI-00840	2.2.3		Allow access OUT parameter as	attribute prefix
RR-0298	2.1		Clarify classes of objects usable as	attribute prefixes
RR-0453	11.1		Provide a special function or	attribute yielding the sign of a numeric value
RR-0613	13.4.1	problems with implementation-defined		attributes /attributes solve portability
RR-0674	13.4.1		Allow user-defined	attributes as functions
RR-0664	12.3.1		Need 'IMAGE and 'VALUE	attributes for floating-point types
RR-0715	2.2	Allow user-defined type conversions and		attributes for numeric types
RR-0716	11.1		Unify and add	attributes for numeric types
RR-0509	13.4.1		Allow user-defined	attributes for user-defined or private types
RR-0406	13.4.1		Allow user-defined	attributes for user-defined types
AI-00539	2.2.4		Allow use of array/record	attributes in representation clauses
AI-00609	11.1	machine characteristics	Floating point machine	attributes inadequate to fully characterize
RR-0048	2.2.4	Extend static expressions to include representation		attributes of composite types
AI-00812	2.2		Make	attributes SAFE_LARGE and SAFE_SMALL static
RR-0613	13.4.1	implementation-defined attributes	User-defined	attributes solve portability problems with
RR-0317	2.2.12			Augment Ada's looping: over reals, list items, etc
RR-0553	4.6		GET_LINE should not	automatically call SKIP_LINE
RR-0475	4.2	reclaim storage	Need	automatically-invoked user-defined routines to
RR-0286C	5.2		Run-time system should	avoid entering privileged mode
RR-0368A	4.3		Ensure unnecessary recompilation is	avoided
RR-0638	13.1	specified explicitly		Axioms for built-in operations should be
RR-0636	11.1		Improve Ada's	axioms for floating point operations
RR-0401	2.2	efficiently because of accuracy/	Mixed-	base fixed-point operations cannot be done
AI-00285	4.4		Need to be able to access a	base numeric type in some algorithms
RR-0190	4.4		Allow use of a	base type within a generic unit
RR-0511	4.4		Allow use of a	base type within a generic unit
RR-0127	13.4		Allow real number output in non-decimal	bases
RR-0569	12.2.2		Relax rules separating	basic from later declarative items
RR-0594	12.2.2		Relax rules separating	basic from later declarative items
RR-0635	13.4		Provide	basic support for extended precision integer arithmetic
RR-0731	11.1		Use the Language Compatible Arithmetic Standard as a	basis for Ada's floating point model
RR-0205	12.3.13		Allow program unit name on PRIVATE,	BEGIN, and EXCEPTION
RR-0735	6.3		Need ability to change interrupt	bindings at run-time
RR-0310	10.4		Need convenient way to pad with	blanks in string assignments
RR-0773	6.2		Need to pack variable-length records into a	block for data transmission
RR-0695	13.1.2		Allow EXIT from	block for legibility
RR-0491	13.1.2		Code would be clearer if one could EXIT from a	block statement
RR-0632	13.1.2		Allow EXIT from a	block statement for consistency
RR-0711	4.6		I/O by a task in multi-task application should not	block whole program
RR-0499	12.3.2		Like other	"blocks", allow exception handlers in accept statements
RR-0370E	4.2		Need to recover space for task control	blocks when tasks are created by an allocator
AI-00382	2.2		Allow generic subprogram	bodies
RR-0562	4.4	compilation of generic specifications and		bodies
RR-0557	4.3	/use of renaming declarations to provide subprogram		bodies helps get around the inability to/
RR-0689	12.2.4		Optional	bodies should not be unlinked without a warning
RR-0764	12.4.1		Allow subprogram	bodies to be defined by RENAMES
RR-0550	12.4.1		Allow subprogram	bodies to be defined by RENAMES or generic instantiation
RR-0093	13.4	of deferred constants to be given in a package		body
RR-0157	12.4.1		Allow renaming when defining a subprogram	body
RR-0214	13.1	Require that a subprogram parameter be used within the		body
RR-0231	12.4.1		Allow a rename definition of a subprogram	body
RR-0307	4.3		of private declarations to be in the package	body
RR-0470	12.4.1		or generic instantiation to define a subprogram	body
RR-0581B	2.1	pragma ELABORATE to a package that has no		body
RR-0688	4.3	required when redeclaring a subprogram		body

RR-0774L	13.1	Allow pragma INTERFACE within a package	body	
RR-0774M	13.1	Allow a subprogram to be renamed in a	body	
RR-0547	2.2	subprograms, allow merge of specification/	body for generic subprograms	Like non-generic
RR-0604	2.2	subprograms, allow merge of specification/	body for generic subprograms	Like non-generic
RR-0725	12.4.1	Need rename in package	body for routine in package specification	
RR-0426A	12.2.4	The effect of an optional package	body is confusing to users	
RR-0268	13.6	Separation of specification and	body is not worth it	
RR-0262	13.7	Do not require existence of subunit for	body stubs	
RR-0426B	2.2	Allow declaration and	body to be combined for generic subprograms	
RR-0364	12.4.1	Allow a subprogram	body to be defined by generic instantiation	
RR-0055	12.4.1	Allow a subprogram	body to be defined by renaming or generic instantiation	
RR-0666	12.4.1	Allow a subprogram	body to be given by generic instantiation	
RR-0667	12.4.1	Allow a subprogram	body to be given by RENAMES	
RR-0096B	12.4.1	Allow a procedure	body to be provided by a renaming declaration	
RR-0257	2.1	Ensure that	BOOLEAN and BYTE arrays can be tightly packed	
RR-0139	6.1	Provide shift and rotate operations for	boolean arrays	
RR-0571A	12.2.5	choice with named associations when index	bounds are determined by context	Use of OTHERS
RR-0252D	2.2	Fixed point type should include the	bounds of the range definition	
RR-0191	2.2	Fixed point model numbers should include the	bounds of the type definition	
RR-0566	2.2	Fixed point model numbers should include the	bounds of the type definition	
RR-0644	9.1	Standard should specify time	bounds/constraints for certain operations	
RR-0534	2.2.13	Allow	brackets other than "(", ")" in aggregates, etc	
RR-0263	13.1	CONSTRAINT_ERROR is too	broadly defined	
RR-0450	6.4	Need efficient manipulation of	buffers whose type is determined at run time	
RR-0729	9.1	way to turn off optimization to eliminate	bugs	Language should provide
RR-0540	4.3	Allow a new package to	build on an existing package	
RR-0638	13.1	Axioms for	built-in operations should be specified explicitly	
RR-0257	2.1	Ensure that BOOLEAN and	BYTE arrays can be tightly packed	
RR-0050	3.1	Provide multi-national and multi-	byte characters	
RR-0766	6.1	Allow bit-wise operations (AND, SHIFT) on integers,	bytes, etc	
RR-0252B	11.1	whether rounding or truncation is used in real	calculations	Programmer needs to know/control
AI-00442	13.4	Time zone information in package	CALENDAR	
RR-0280	5.1	Short delays are too inefficient;	Calendar time unnecessary; timing performance	
RR-0352	5.1	Require	Calendar.Clock to return consistently accurate	
RR-0458	4.4	way to escape into weakly typed subprogram	call	Need convenient
RR-0658	5.2	statement possibility in a conditional entry	call	Allow accept
RR-0697	5.2	Allow entry	call alternative in selective wait	
RR-0251	13.6	Invent new notations to distinguish function	call, array reference, and conversions	
RR-0659	4.4	Need to make entry	call on a generic formal parameter	
RR-0060	2.2.9	Allow inlining of subprograms from some but not all	call sites	
RR-0553	4.6	GET_LINE should not automatically	call SKIP_LINE	
RR-0014	4.1	Need to	call subprograms loaded in ROM	
RR-0064	4.1	Allow some form of subprogram	callback	
AI-00832	2.3	Effect of depending on parameter passing method when	calling non-Ada programs	
RR-0158	13.3	Allow multi-way conditional and timed entry	calls	
RR-0498	5.2	with respect to accept statements and entry	calls	Make selective wait symmetrical
RR-0629	4.1	and function types for use in subprogram	calls	Need procedure
RR-0708	13.5	Allow infix function	calls	
RR-0471	13.6	Allow specification of parameter modes in subprogram	calls for clarity	
RR-0076	5.2	based on priorities	calls from entry queues and open alternatives	
RR-0421D	6.3	/of interrupts as ordinary, timed, or conditional	calls may depend inappropriately on the/	
RR-0083	5.3	Provide asynchronous transfer of control via entry	call/selective wait construct	
RR-0336	13.4.4	definitions in records; nice for array-of-array	case	Allow array type
RR-0199	12.3.13	Allow IF,	CASE, and SELECT constructs to be named	
AI-00477	13.5.2	/characters are numeric, upper case, lower	Case choices should not have to be static	
AI-00216	10.2	Allow optional simple name on	case, control, etc., independent of character/	
RR-0340	12.3.13	/testing whether characters are numeric, upper	CASE, IF, and SELECT statements	
AI-00216	10.2	Allow mixed	case, lower case, control, etc., independent of/	
RR-0359	4.6	Allow non-static case statement choices, non-discrete	case output for enumeration literals	
RR-0650	13.5.2	Generalize	case statement expression	
RR-0320	13.5	Generalize	case statement for other types, including REAL	
RR-0312	13.5	Allow	case statement to decision table	
RR-0561	13.5.2	select actions depending on state without using	case statement to operate on strings for string processing	
RR-0647	4.1	Allow	case statements	Need ability to
RR-0621C	13.4	for intermediate results	case statements to dispatch on value of an exception	
RR-0135	13.4	Provide	Catenation should not raise CONSTRAINT_ERROR	
RR-0535	11.1	Need support for floor,	CEILING and FLOOR numeric operators	
RR-0358	11.1		ceiling, truncate, and whole operations	

RR-0733	13.5		Need fixed-point types not	centered on zero
RR-0150	13.7	memory requirements	Provide	"chaining" of different programs to reduce
RR-0020	5.2		program execution, so priorities should be	changeable /of functions may change during
RR-0130	4.6		Replace DEFAULT_xy variables in	Chapter 14 by functions
RR-0294	met		not suitable for embedded applications; make	Character 14 optional I/O packages are
AI-00420	3.1		Allow 256 values for type	CHARACTER
RR-0331	3.1		Need predefined LONG_	CHARACTER (16 bits) and LONG_LONG_CHAR (32)
RR-0390	3.1		Need 8-bit unsigned	CHARACTER for Greek and graphics symbols
RR-0096A	12.2.3		Permit renaming an enumeration literal as a	character literal
AI-00390	12.2.3	visible by a subtype declaration		Character literals should be made directly
RR-0528	2.1		Change Ada	character names to recognized names for verbal comm.
AI-00216	10.2		case, lower case, control, etc., independent of	character representation /are numeric, upper
RR-0201A	13.5.1		Liberalize overloading of operators to other	character sequences
RR-0034	3.1		Ada should use ISO 8859/1-9 (8-bit)	character set
RR-0438	3.1		Allow use of multi-octet	character set
RR-0311	3.1		Generalize	character set for 8-bit characters
RR-0367	3.1		Need support for national language	character sets, including string comparison
AI-00609	11.1		inadequate to fully characterize machine	characteristics /point machine attributes
RR-0252A	11.1		point standard; allow full use of machine	characteristics /support for IEEE floating
AI-00609	11.1		Floating point machine attributes inadequate to fully	characterize machine characteristics
RR-0050	3.1		Provide multi-national and multi-byte	characters
RR-0311	3.1		Generalize character set for 8-bit	characters
RR-0148	3.1		Provide support for extended and graphic	characters (256 ASCII set)
AI-00216	10.2		Provide standard methods for testing whether	characters are numeric, upper case, lower case/
RR-0330	3.1		Allow national	characters in literals, comments, and identifiers
RR-0619	2.2		Eliminate three replacement	characters, stick to normal ASCII
RR-0574	2.2		Inability to eliminate constraint	check for OUT parameters
RR-0301	2.1	can be improved	The wording concerning	checking for consistency between compilations
RR-0584	4.4	instantiation is given	Need stricter	checking of formal generic subtypes when an
RR-0554	9.1	I/O input	Need constraint	checks for target of Unchecked_Conversion and
RR-0571B	2.1	the applicable/	Clarify the effect when the	choice in an aggregate is outside the range of
RR-0571A	12.2.5	bounds are determined by/	Allow use of OTHERS	choice with named associations when index
RR-0650	13.5.2		Allow non-static case statement	choices, non-discrete case statement expression
AI-00477	13.5.2		Case	choices should not have to be static
RR-0252C	11.1		Ensure programmer can	choose appropriate floating point representation
RR-0103B	6.2		means of reading large data structures in	chunks Provide efficient
RR-0265	13.7		Allow implementations to short-	circuit in general, forget AND THEN
RR-0662	4.3		Need package	classes and inheritance for object-oriented programming
RR-0271	13.6	CONTROLLED or STATIC	Distinguish storage	classes for variables with key words like
RR-0167	4.3		Allow	classes of abstract data types
RR-0298	2.1		Clarify	classes of objects usable as attribute prefixes
RR-0730	13.4		part of a package should have its own context	clause The private
RR-0291	6.4		Clarify whether use of an address	clause causes storage to be initialized
RR-0699	13.3		Do not treat an unaccepted length	clause for a type as an error
RR-0114	6.3	the type	Allow an address	clause for each task instance, and not just on
RR-0288	13.5		Integrate representation	clause information with declarations
RR-0581C	13.4		to mention a package name given in the context	clause of a parent library unit /for a subunit
RR-0200	12.3.4		Allow optional when_	clause on RAISE and RETURN statements
RR-0362	12.3.4		Allow optional when_	clause on the raise statement
RR-0417	6.2	of bits	Length	clause should force allocation of EXACT number
RR-0588	13.4		Provide a form of USE	clause that hides outer homographs
RR-0555	12.2.3	a type	Need "selective" USE	clause to get just operators and subprograms of
AI-00274	13.1		Proposed extension of the USE	clause — record component visibility
AI-00539	2.2.4		Allow use of array/record attributes in representation	clauses
RR-0095	13.4		Allow applicable units to be named in USE	clauses and pragma ELABORATE
RR-0065	4.3		To improve reuse possibilities, allow rep	clauses and various pragmas to be separated from/
RR-0418	2.2		Representation	clauses for array types need to be added
RR-0411	2.4		Express record representation	clauses in a machine-independent way
RR-0565	2.2		*SMALL is unsuitably defined; need for representation	clauses inappropriate
RR-0290	13.5		The syntax used in record representation	clauses is hard to read
RR-0677	2.2.2		Allow initialization	clauses on scalar type declarations
RR-0171	4.3		Allow target-dependent code (including rep	clauses) to be separate from other code
RR-0274	2.1		The visibility rules could be explained more	clearly
AI-00223	5.1		Require adequate resolution for the function	CLOCK
RR-0037	5.2		using simulated time rather than a real-time	clock
RR-0107	5.1		Allow application to specify	clock timing interval if hardware allows this flexibility
RR-0105	5.1		Allow application to set/adjust	clocks
RR-0439	4.2		Require automatic garbage	collection

RR-0643	4.2		Garbage	collection can now be done well; encourage its use
RR-0019	4.2		procedures for safely controlling use of	collections /types to specify finalization
RR-0507	11.2		Provide information/control over row-major or	column-major ordering
RR-0426B	2.2		Allow declaration and body to be	combined for generic subprograms
RR-0355	2.4		Standardize means of getting the OS	command line arguments
RR-0709	2.4		Need more portability in getting	command line inputs
RR-0330	3.1		Allow national characters in literals,	comments, and identifiers
RR-0746	13.7		Allow pictures/graphics as	comments in source code
RR-0181	8.1		Need standard means of	communicating between Ada programs
RR-0222	8.1		predefined packages for process control/	communication
RR-0528	2.1		character names to recognized names for verbal	communication
RR-0665C	5.4		Support message-driven intertask	communication
RR-0587	5.4		Provide for	communication between loosely coupled tasks
RR-0378	8.1		Need standard means of	communication in distributed system
RR-0183	5.4		Asynchronous inter-task	communication is not available
RR-0224	8.1		Add	communication support required for distributed systems
RR-0367	3.1		language character sets, including string	comparison
RR-0731	11.1	Ada's floating point model	Use the Language	Need support for national
RR-0343	13.4		Provide better facilities for conditional	Compatible Arithmetic Standard as a basis for
RR-0356	13.4		Need a way to get the	compilation
RR-0692	2.3	pragmas are not/	/pragmas to cause unsuccessful	compilation date and time within a program
RR-0237	4.3		Make separate	compilation if restrictions implied by the
RR-0562	4.4		Require separate	compilation independent of a particular library model
RR-0283	4.3		Need convenient way to set global	compilation of generic specifications and bodies
RR-0091	4.3		Don't specify the	compilation parameters
RR-0757	2.1		Clean up definitions of program unit and	compilation process in the Standard
RR-0154	13.1		Subunits should not have to be at the outermost	compilation unit
RR-0545	13.1		Subunits should not have to be at the outermost	compilation unit level
RR-0065	4.3		/clauses and various pragmas to be separated from the	compilation unit level
RR-0607	13.1		Allow names of	compilation unit to which they apply
RR-0242	2.3		Require	compilation units to be overloadable, operator symbols
RR-0301	2.1	The wording concerning checking for consistency between		compilation warnings for potential run-time errors
RR-0279	2.2	If tasks are not used, the run-time system and		compilations can be improved
RR-0177	4.3	Standardize interface between		compiled code should not include code for/
RR-0175	5.2	Define interface between		compiler and library for configuration management
RR-0386	9.1	Need standard way of telling the		compiler- and target-specific run-time system aspects
RR-0387	2.2	Relax 11.6 optimization rules to allow		compiler not to optimize
RR-0209	2.3	Require the		compiler to do more optimizing
RR-0368B	4.3	by tools other than those provided by the		compiler to report certain-to-be-raised exceptions
RR-0353	2.4	Unchecked conversion should eliminate		compiler vendor /the library can be manipulated
RR-0003	4.2	Provide a		compiler-dependent fields
RR-0062	7.1	Ensure memory mapped devices are treated correctly by		compiler-independent finalization mechanism
RR-0626	6.2	/and DIRECT_IO are not portable among		compilers
RR-0616	2.3	constraint errors	Require	compilers, even for the same target machine e.g./
RR-0328	9.3	Require		compilers to diagnose statically-detectable
RR-0211	2.3	Require		compilers to report questionable uses of the language
RR-0700	13.1	functions like sin(10.0) are evaluated at		compilers to report unrecognized or incorrect pragmas
RR-0165	2.3	Allow parameter constraint violations to be		compile-time
RR-0639	8.2	Need		compile-time errors
RR-0261	2.3	elaboration errors	Need	compile-time initialization of complex data structures
RR-0244B	2.3	Flag run-time errors at		compile-time warnings for access before
AI-00540	12.4.2	subtype declaration		compile-time when possible
RR-0208	13.4	and SEQ_IO operations without waiting for		Completing a private type declaration with a
RR-0305	2.1	Clarify wording of FOR loop		completion /to initiate TEXT_IO, DIRECT_IO,
RR-0542	2.2.5	another allow usage of private type before its		completion
RR-0307	4.3	package body	Allow	completion declaration
AI-00429	13.4.4	Allow array type definition for record		completion of private declarations to be in the
RR-0198	13.4	Allow positional aggregate for single-		component
RR-0240	12.3.11	Non-sliding aggregates and slices in		component aggregate
RR-0462	12.3.7	even when the selected/	Allow selected	component associations
RR-0462	12.3.7	/type mark in a formal part even when the selected		component form of type mark in a formal part
RR-0707	2.2.6	Need same-name		component has the same identifier as the/
RR-0573	12.3.11	Slide indices of array aggregates for record		component identifiers in different variants
RR-0133	7.2	Allow a task		component initialization and as components of/
RR-0577	2.2	/deferred constant of composite type having a		component of an array to get its index
RR-0679	13.4	Allow		component of an incompletely declared private/
RR-0086	13.4	Need to initialize a record		component selection on objects of a private type
AI-00274	13.1	Proposed extension of the USE clause — record		component to the address of the record itself
				component visibility

RR-0212	13.6	Allow assignment to record discriminant like other	components	
RR-0321	13.4	array and record declarations for record	components	Permit anonymous
RR-0381	2.2	Records should have composed operations with respect to	components	
RR-0443	13.4.4	Need for anonymous array types as record	components	
RR-0749	12.3.11	as actual parameters and as values in record	components	/index sliding for slices serving
RR-0755	2.2.13	Allow "[" instead of "(" for indexed	components	
RR-0532	2.2.6	Allow same-type record	components	
AI-00142	7.1	Allow pragma SHARED to be applied to	components in different variants to share name	
RR-0524	6.4	Allow functions to return references to	components of composite objects	
RR-0573	12.3.11	/aggregates for record component initialization and as	components of objects; allow programmer to ensure/	
RR-0381	2.2	Records should have	components of record aggregates	
AI-00142	7.1	Allow pragma SHARED to be applied to components of	composed operations with respect to components	
RR-0119	7.1	Need synchronized reference to elements of shared	composite objects	
RR-0577	2.2	Allow deferred constant of	composite objects	
RR-0048	2.2.4	to include representation attributes of	composite type having a component of an incompletely/	
RR-0718	9.1	Need predictable results in numeric	composite types	Extend static expressions
RR-0349	6.3	Interrupt addresses and memory addresses are	computation, especially regarding optimization	
RR-0174	4.3	Allow packages to be generic with respect to	conceptually different and should not be/	
RR-0132	12.3.4	with EXIT statement	concurrency protection	
RR-0141	12.3.4	Allow optional WHEN	<condition> on RAISE statement for consistency	
RR-0614	12.3.4	value clearer	<condition> on RAISE statements	
RR-0158	13.3	Allow multi-way	condition RETURN to make selection of returned	
RR-0421D	6.3	/treatment of interrupts as ordinary, timed, or	conditional and timed entry calls	
RR-0343	13.4	Provide better facilities for	conditional calls may depend inappropriately on/	
RR-0658	5.2	Allow accept statement possibility in a	conditional compilation	
RR-0518	13.1	Provide syntax to declare subprogram pre/post	conditional entry call	
RR-0177	4.3	Standardize interface between compiler and library for	'conditions	
RR-0344	2.2	Need to simplify/relax the	configuration management	
RR-0631	2.2	Make	conformance rules	
RR-0426C	13.6	Omitting index constraint in	conformance rules consistent	
AI-00538	13.4	Declaring	constant arrays causes programmer errors	
RR-0018	6.4	Need pre-elaborated	constant arrays with an anonymous type	
RR-0329	13.1	Using a deferred	constant arrays with variable-sized elements	
RR-0246	8.2	time when initialized with static/	constant before it has a value	
RR-0452	13.4	overloadable constants)	constant declarations are not elaborated at run	
RR-0700	13.1	at compile-time	constant functions in static expressions (or	
AI-00681	13.4	of an incompletely declared/	constant functions like sin(10.0) are evaluated	
RR-0577	2.2	Limited types need assignment,	constant of a N' LL record type	
RR-0001	4.2	in static expressions (or overloadable	constant of composite type having a component	
RR-0452	13.4	Allow deferred	constants	
RR-0313	13.4	Allow subprogram types, variables,	constants)	Allow constant functions
RR-0611	4.1	Changes to package	constants of arbitrary (i.e., non-private) types	
RR-0451	4.3	Allow full declaration of deferred	constants, parameters, etc	
RR-0093	13.4	Allow	constants should not cause recompilation	
RR-0100	13.4	Need to declare	constants to be given in a package body	
RR-0653	8.2	Distinguish unconstrained/	constants to use default values to get value	
RR-0006	4.4	Distinguish unconstrained/	constants whose value is supplied after linking	
RR-0472	4.4	Semi-	constrained generic formal types	
AI-00427	13.7	Allow "partially"	constrained generic formal types	
RR-0473	13.5	Tighten the contract model by distinguishing	constrained subtypes	
RR-0446	4.4	is outside the range of the applicable index	constrained subtypes of discriminated records	
RR-0571B	2.1	Inability to eliminate	constrained/unconstrained generic types	
RR-0574	2.2	Unchecked_Conversion and I/O input	constraint	/when the choice in an aggregate
RR-0554	9.1	Require compilers to diagnose statically-detectable	constraint check for OUT parameters	
RR-0616	2.3	Omitting index	constraint checks for target of	
RR-0426C	13.6	/use of OTHERS with named associations when the index	constraint errors	
RR-0029	12.2.5	Allow parameter	constraint in constant arrays causes programmer errors	
RR-0165	2.3	Break up overly broad predefined exceptions, e.g.,	constraint is determined by context	
RR-0399	13.1	Delete NUMERIC_ERROR if now subsumed under	constraint violations to be compile-time errors	
RR-0583	2.1	Catenation should not raise	CONSTRAINT_ERROR	
RR-0135	13.4	Standard should specify time bounds/	CONSTRAINT_ERROR	
RR-0263	13.1	Allow variable declaration to get	CONSTRAINT_ERROR for intermediate results	
RR-0644	9.1	Need	CONSTRAINT_ERROR is too broadly defined	
RR-0567	2.2	Section 13.6 of the standard has no semantic	constraints for certain operations	
RR-0660	4.2	when the index constraint is determined by	constraints from initial value	
RR-0702	2.1	when index bounds are determined by	constructors and destructors for package types	
RR-0029	12.2.5		content	
RR-0571A	12.2.5		context	Use of OTHERS with named associations
			context	/OTHERS choice with named associations

RR-0730	13.4	The private part of a package should have its own	context clause	
RR-0581C	13.4	subunit to mention a package name given in the	context clause of a parent library unit	for a
RR-0282	13.3	Ada program structure hides important	context information	
RR-0774E	4.5	Provide access to	context of an exception situation	
RR-0726	6.4	Need non-	contiguous arrays, static pointers	
RR-0031	13.5.3	Provide a way to test for a value in a non-	contiguous set	
RR-0446	4.4	constrained/unconstrained generic/	contract model by distinguishing	
AI-00003	13.1	Allow data of mode IN in SEND_	CONTROL	
RR-0106	5.3	Provide asynchronous transfer of	control	
RR-0015	5.2	Allow task priorities to	control all queuing/select decisions	
RR-0347	5.2	/applications to change priorities under program	control; allow task priority to increase as a/	
RR-0370E	4.2	Need to recover space for task	control blocks when tasks are created by an allocator	
RR-0759	13.3	Add real-time and verification facilities for	control engineering	
AI-00216	10.2	/characters are numeric, upper case, lower case,	control, etc., independent of character/	
RR-0774C	4.3	Extend	control of library unit visibility	
RR-0575	2.2.9	Need better (more selective)	control over inlining	
RR-0110	6.4	different types or regions of/	control over placement of and access to data in	
RR-0507	11.2	Provide information/	control over row-major or column-major ordering	
RR-0121	5.2	Provide more user	control over scheduling decisions	
RR-0737	5.2	select statement	control over selection of alternatives in a	
RR-0276	5.1	Need user specified accuracy and precision	control over timing	
AI-00211	13.4	Additional	control statement to hop to end of the loop	
RR-0615	2.2.12	Define LOOP/UNTIL	control structure as in Pascal	
RR-0286A	5.2	Embedded system users need the ability to	control timer utilities	
RR-0083	5.3	Provide asynchronous transfer of	control via entry call/selective wait construct	
RR-0457	4.3	Structure library units as groups,	control visibility of library units	
RR-0252B	11.1	in real calculations	control whether rounding or truncation is used	
RR-0222	8.1	Programmer needs to know/	control/communication	
RR-0361	4.6	Need additional predefined packages for process	controlling the output format of numbers	
RR-0019	4.2	Increase the number of options for	controlling use of collections	Allow types
RR-0239B	2.2.3	to specify finalization procedures for safely	conversion	A renamed
RR-0724	2.1	type cannot be used in an actual parameter; type	conversion	Need clearer/simpler overload
RR-0734	12.3.11	resolution rules, especially for implicit	conversion	
RR-0554	9.1	Generalize cases that allow implicit subtype	Conversion and I/O input	
RR-0338	6.4	Need constraint checks for target of Unchecked_	conversion between ADDRESS values and access/	
RR-0103A	2.2.3	Provide pointers to static objects and safe	conversion for IN OUT and OUT parameters	
RR-0476	13.6	Allow unchecked	conversion functions with the same name as the	
RR-0449	13.1	target type	conversion of private types	
RR-0353	2.4	Do not allow unchecked	conversion should eliminate compiler-dependent fields	
RR-0009	12.3.6	Unchecked	conversion to static discrete type of static	
AI-00873	2.3	discrete expression	conversion/qualification of undefined scalar values	
RR-0251	13.6	Type	conversions	Invent new notations to
RR-0510	2.2.10	distinguish function call, array reference, and	conversions	
RR-0715	2.2	Re-indexing arrays via type	conversions and attributes for numeric types	
RR-0099	12.3.6	Allow user-defined type	conversions should be allowed in static expressions	
RR-0062	7.1	Explicit type	correctly by compilers	
RR-0134	13.6	Ensure memory mapped devices are treated	count on abandoned entries	
RR-0275	2.2	Require re-evaluation of entry'	counter-intuitive aspects of RENAMES	
RR-0544	4.2	Error-prone and	counts	
RR-0370E	4.2	Need indivisible update on reference	created by an allocator	Need to recover
RR-0435	9.3	space for task control blocks when tasks are	critical applications	Need secondary
RR-0063	5.3	standard for simple Ada subset for safety-	critical functions	
RR-0206	2.1	Protect tasks from being aborted while performing	cross references	
RR-0309	2.1	Paragraph numbers should be included in the	cross references are complete and correct	
RR-0389	13.4	Ensure all	"cyclic" discrete types in the language	
RR-0431	5.3	There is a need for	cyclic tasks	
RR-0270	13.4	A terminate alternative cannot be used to stop	data from a package	
RR-0110	6.4	Allow specification of read-only	data in different types or regions of memory	
AI-00003	13.1	/control over placement of and access to	data of mode IN in SEND_CONTROL	
RR-0678	7.1	Allow	data shared between programs; need VOLATILE	
RR-0639	8.2	Pragma SHARED is not sufficient for	data structures	
RR-0103B	6.2	Need compile-time initialization of complex	data structures in chunks	
RR-0773	6.2	Provide efficient means of reading large	data transmission	Need to
RR-0166	13.3	pack variable-length records into a block for	data type	Allow definition
RR-0167	4.3	of the literal representations of an abstract	data types	
RR-0356	13.4	Allow classes of abstract	date and time within a program	
RR-0656	5.1	Need a way to get the compilation	deadline scheduling	
RR-0127	13.4	Need timed exceptions for	decimal bases	
		Allow real number output in non-		

RR-0357	10.1	Need packed decimal, wide-ranging fixed-point,	decimal deltas	
AI-00378	12.2.3	should be made directly visible by a subtype	declaration	Enumeration literals
AI-00390	12.2.3	should be made directly visible by a subtype	declaration	Character literals
AI-00480	12.2.3	Operators should be made directly visible by a subtype	declaration	
AI-00540	12.4.2	Completing a private type declaration with a subtype	declaration	
RR-0096B	12.4.1	Allow a procedure body to be provided by a renaming	declaration	
RR-0096C	12.4.2	of a private type to be provided by a renaming	declaration	Allow the full declaration
RR-0542	2.2.5	usage of private type before its completion	declaration	One way or another allow
RR-0690	12.4.2	and private types to be completed by subtype	declaration	Allow incomplete
RR-0426B	2.2	Allow	declaration and body to be combined for generic subprgrms	
RR-0096C	12.4.2	a renaming declaration	Allow the full	declaration of a private type to be provided by
RR-0010	2.2	discriminants to be a derived/	Allow the full	declaration of a private type with
RR-0093	13.4	in a package body	Allow full	declaration of deferred constants to be given
RR-0082	2.2.5	visible package specification	Allow	declaration of objects of private types in
RR-0094	2.2		Make the multiple	declaration rules more complete and consistent
RR-0567	2.2		Allow variable	declaration to get constraints from initial value
AI-00540	12.4.2	Completing a private type	declaration with a subtype declaration	
RR-0267	2.1	confusing in distinguishing specifications and	declarations	The Standard is
RR-0288	13.5	Integrate representation clause information with	declarations	
RR-0448	4.3	sets of subprograms to depend on common	declarations	Allow different
RR-0677	2.2.2	Allow initialization clauses on scalar type	declarations	
RR-0727	12.2.3	Need selective direct visibility of package	declarations	
RR-0032	12.2.2	Allow grouping of variable	declarations and related subprograms	
RR-0259	13.7	Incomplete type	declarations are dangerous and unnecessary	
RR-0246	8.2	when initialized with/	declarations are not elaborated at run time	
RR-0429	12.2.3	Need construct that makes just overloadable	declarations directly visible	
RR-0321	13.4	Permit anonymous array and record	declarations for record components	
RR-0005	4.4	sharing unnecessarily difficult	declarations in generic packages make code	
RR-0428	12.2.2	Exception	declarations is too restrictive	
RR-0753	13.6	Order of	declarations more consistent	
AI-00518	13.4	Make syntax for task type	declarations needlessly different	
RR-0423	2.2	Fixed and floating type	declarations of private types	
RR-0425	13.1	Remove discriminant restriction on full	declarations of real subtypes	
RR-0601	2.2	Need open ranges in	declarations to be defined by RENAMES	
RR-0307	4.3	Allow library-level	declarations to be in the package body	
RR-0557	4.3	Allow completion of private	declarations to provide subprogram bodies helps	
RR-0569	12.2.2	get around the inability/	declarative items	
RR-0594	12.2.2	Relax rules separating basic from later	declarative items	
AI-00681	13.4	Relax rules separating basic from later	declare a constant of a NULL record type	
RR-0653	8.2	Can't	declare constants whose value is supplied after linking	
RR-0712	4.4	Need to	declare double precision numeric types within a	
RR-0517	9.3	Need ability to	declare program units free from side-effects	
RR-0518	13.1	Provide syntax to	declare subprogram pre/post conditions	
RR-0022	12.2.3	Provide syntax to	declared in another package	
RR-0370A	8.2	Need direct visibility of operators	declared in library units when reconfiguring a system	
RR-0258	6.4	Can't recover space	declared objects	
RR-0293	6.4	Need access values that point to	declared objects	
RR-0577	2.2	Allow access values to point to	declared private type	/constant of composite
RR-0427	12.1.1	type having a component of an incompletely	declared task object	
RR-0652	12.2.3	Do not permit a function to return a locally-	Declaring a subtype should make the equality	
AI-00538	13.4	operator directly visible	Declaring constant arrays with an anonymous type	
RR-0269	13.6	Make subprograms not recursive by	default	
RR-0497	13.7	actual can yield a surprising/	default discriminants for types used as generic	
RR-0576	13.4	Presence of	default expressions to make use of previous IN parameters	
RR-0447	4.6	Allow parameter	default file at any point	
RR-0169	13.4	Need to be able to preserve/restore the	default generic formal subprogram values	
RR-0350	2.1	Allow "null" procedures for actual or	default initial values	
RR-0595	2.2.2	Clarify wording dealing with	default initialization for all types	
RR-0649	2.2.2	Allow	default initialization for all types (not just records)	
RR-0161	2.2.2	Allow	default initialization for any non-limited type	
RR-0129	2.2.2	Allow	default initialization to be specified for any	
RR-0714	12.3.8	non-limited type	default names for all generic formal parameters	
AI-00473	2.2.3	Any form of actual parameter should be allowed as a	default parameter	
RR-0097	13.4	Allow/require explicit action to get	default parameter value	
RR-0007	2.4	should be specified	Default representation for enumeration types	
AI-00519	2.2	the range	Default SMALL should be a power of two times	
RR-0247	13.6	Don't initialize access variables by	default to NULL	
RR-0100	13.4	Allow constants to use	default values to get value	

RR-0484	4.6	generic TEXT_IO packages	Add	DEFAULT_xy functionality as parameters to
RR-0130	4.6		Replace	DEFAULT_xy variables in Chapter 14 by functions
RR-0120	4.2	space is exhausted	Allow users to	defer the signalling of STORAGE_ERROR when
RR-0329	13.1		Using a	deferred constant before it has a value
RR-0577	2.2	component of an incompletely declared/	Allow	deferred constant of composite type having a
RR-0313	13.4	non-private) types	Allow	deferred constants of arbitrary (i.e.,
RR-0093	13.4		Allow full declaration of	deferred constants to be given in a package body
RR-0116	5.2	priorities needed for mode change and graceful		degradation
RR-0192	5.2	priorities during mode change and for graceful		degradation
RR-0384	5.1	which causes an exception after specified		delay
RR-0612	13.3		Should allow both	delay and terminate alternatives in selective wait
RR-0421A	6.3		Need to	delay in processing an interrupt
RR-0281	2.1		Confusing treatment of term	"delay statement"
RR-0280	5.1	unnecessary; timing performance must be/	Short	delays are too inefficient; Calendar time
RR-0037	5.2	than a real-time clock	Allow tasks (i.e.,	delays) to execute using simulated time rather
RR-0253	13.1		DIGITS and	DELTA approach leads to inefficiency, non-portability
RR-0256	13.1		Fixed-point approach with range and	delta is not what is needed
RR-0357	10.1	Need packed decimal, wide-ranging fixed-point, decimal		deltas
RR-0421D	6.3	/as ordinary, timed, or conditional calls may		depend inappropriately on the run-time system
RR-0448	4.3	Allow different sets of subprograms to		depend on common declarations
RR-0459	2.4	for interoperability; lessen implementation		dependence
RR-0042	2.3	Clarify the meaning of incorrect-order		dependence and its effects
RR-0066	2.3	with erroneous execution/incorrect order		dependences
RR-0143	9.1	Document implementation		dependences
RR-0179	6.3	The treatment of interrupts is too implementation-		dependent
RR-0335	5.3	Effect of abort statement is too implementation-		dependent
RR-0236	2.4	documented whenever/	Reduce implementation-	dependent behavior, or at least, ensure it is
RR-0171	4.3	separate from other code	Allow target-	dependent code (including rep clauses) to be
RR-0353	2.4	Unchecked conversion should eliminate compiler-		dependent fields
RR-0582	4.5	/for getting additional implementation-		dependent info about state when an exception is raised
RR-0215	2.1	Clarify termination of tasks		dependent on library packages
RR-0124	5.2	Ensure that code		dependent on task scheduling algorithms is portable
AI-00832	2.3	calling non-Ada programs	Effect of	depending on parameter passing method when
RR-0647	4.1		Need ability to select actions	depending on state without using case statements
RR-0558	13.4	Deriver of type should be able to hide subset of		derived operations
RR-0010	2.2	of a private type with discriminants to be a		derived type
RR-0080	13.3			Derived types are clumsy
RR-0482	4.3	needed operations	Multiple	derived types from same package do not generate
RR-0052	4.3	desired operations	Multiple	derived types from same package do not give
RR-0599	4.3		Certain changes to	derived/private types will help inheritance
RR-0558	13.4	of derived operations		Deriver of type should be able to hide subset
RR-0238	6.4		Allow access values to	designate read-only memory
RR-0287	2.4		Make access types point directly to	designated object
RR-0197	13.6	For access types, parameter mode IN should mean the		designated object cannot be modified
RR-0225	11.1	Ensure floating point representation with		desired accuracy is used
RR-0052	4.3	Multiple derived types from same package do not give		desired operations
RR-0541	4.2		Allow user-defined :=, =,	DESTROY operations to support memory management
RR-0660	4.2		Need constructors and	destructors for package types
RR-0450	6.4	Need efficient manipulation of buffers whose type is		determined at run time
RR-0029	12.2.5	named associations when the index constraint is		determined by context
RR-0571A	12.2.5	with named associations when index bounds are		determined by context
RR-0485	4.6	to get the line length of an input or output		device
RR-0062	7.1		Ensure memory mapped	devices are treated correctly by compilers
RR-0077	13.4		Provide stream I/O for	digital signal processing
RR-0253	13.1	inefficiency, non-portability		DIGITS and DELTA approach leads to
RR-0564	11.1	Allow implementation freedom to include more mantis***		digits in floating point safe numbers
RR-0494	13.4.2		Allow slices for any	dimension in multidimensional arrays
RR-0508	13.4.2		Allow slices for any	dimension in multidimensional arrays
RR-0354	13.6		Introduce	dimensional mathematics into the language
RR-0745	13.6		Add facilities for	dimensional mathematics to the language
RR-0624	12.2.3		Provide selective	direct visibility into a package
RR-0393	12.2.3	operator by renaming	Can't get	direct visibility of fixed point mult and div
RR-0022	12.2.3	another package	Need	direct visibility of operators declared in
RR-0232	12.2.3		Need to allow	direct visibility of operators in packages
RR-0727	12.2.3		Need selective	direct visibility of package declarations
RR-0057	12.2.3		Need	direct visibility to infix operators in another package
RR-0474	12.2.3	and operators of a type	Need	direct visibility to just enumeration literals
RR-0694	12.2.3		Need easy	direct visibility to the equality operations

RR-0208	13.4	waiting for/	Need ability to initiate TEXT_IO,	DIRECT_IO, and SEQ_IO operations without
RR-0626	6.2	even for/	Files produced by SEQUENTIAL_IO and	DIRECT_IO are not portable among compilers,
RR-0593	4.6		Mandate implementation of variant record I/O in	DIRECT_IO/SEQUENTIAL_IO
RR-0278	5.2		Tasking model should support common scheduling	disciplines more easily
RR-0046	13.5.3		Allow testing in	discontiguous ranges and create true sets
RR-0603	13.5.3		Allow	discontiguous subtypes of discrete types
RR-0058	13.5.3		Allow	discontiguous subtypes of enumeration types
RR-0650	13.5.2		Allow non-static case statement choices, non-	discrete case statement expression
RR-0009	12.3.6		conversion to static discrete type of static	discrete expression
RR-0744	2.2.12		Allow for loop to have non-	discrete (fixed-point) parameter
AI-00140	12.3.12		Allow -1..10 as a	discrete range in loops
RR-0623	12.3.3		Define RANGE attribute for	discrete ranges
RR-0522	2.2		Allow non-	discrete record discriminants
RR-0009	12.3.6		Allow static conversion to static	discrete type of static discrete expression
RR-0363	12.3.1		and 'IMAGE to apply to real types as well as	discrete types
RR-0603	13.5.3		Allow discontinuous subtypes of	discrete types
RR-0389	13.4		There is a need for "cyclic"	discrete types in the language
RR-0289	6.2		views of a record structure even when no	discriminant is present
RR-0212	13.6		Allow assignment to record	discriminant like other components
RR-0423	2.2	of private types	Remove	discriminant restriction on full declarations
RR-0341	2.2		Allow	discriminant value in record aggregate to be non-static
AI-00345	4.6		Record type with variant having no	discriminants
RR-0522	2.2		Allow non-discrete record	discriminants
RR-0497	13.7	can yield a surprising/	Presence of default	discriminants for types used as generic actual
RR-0264	13.3			Discriminants need to stand out more
RR-0248	13.1		Allow users to specify locations for	discriminants that are outside record values
RR-0010	2.2		Allow the full declaration of a private type with	discriminants to be a derived type
RR-0473	13.5		Allow "partially" constrained subtypes of	discriminated records
RR-0621C	13.4		Allow case statements to	dispatch on value of an exception
RR-0503	4.1		Provide subprogram types for	dispatcher-style programming
RR-0109	8.1		that are helpful when dealing with a single	distributed Ada program
RR-0728	8.1		Need simple Ada run-time system for	distributed memory MIMD architectures
RR-0071	13.2		Improve support for heterogeneous	distributed processing
RR-0378	8.1		Need standard means of communication in	distributed system
RR-0224	8.1		Add communication support required for	distributed systems
RR-0374	4.2		address memory management requirements in	distributed systems
RR-0515	4.2		update for specific objects, especially in	distributed systems
RR-0376	13.3		Need special treatment of exceptions in	distributed/parallel/multi-processor systems
RR-0393	12.2.3		Can't get direct visibility of fixed point mult and	div operator by renaming
RR-0537	13.6		Separate integer	divide and floating divide as in Pascal
RR-0591	2.2.8		Allow fixed-point multiply/	divide with universal real operands
AI-00262	2.2.8		Real literals with fixed point multiplication and	division
RR-0143	9.1			Document implementation dependences
RR-0176	9.1	allocation strategies		Document run-time system performance and memory
RR-0481	2.1		Make Ada	documentation available in SGML format
RR-0280	5.1		time unnecessary; timing performance must be	documented
RR-0236	2.4		/behavior, or at least, ensure it is	documented whenever possible
RR-0334	7.2		/to specify task parameters giving a task its work	domain, e.g., to process part of an array
RR-0626	6.2		for the same target machine e.g., because of	dope vectors
RR-0712	4.4		Need ability to declare	double precision numeric types within a generic unit
AI-00526	2.4		Rounding up or	down
RR-0213	2.4		to find out if an implementation rounds up or	down
RR-0665C	5.4		Support message-	driven intertask communication
RR-0373	8.2		Need to be able to	dynamically alter a program as it is running
RR-0126	13.4		Allow underscore before	"E" in exponents
RR-0278	5.2		support common scheduling disciplines more	easily
RR-0051C	10.4		Provide packages for string	edit functions
RR-0450	6.4	determined at run time	Need	efficient manipulation of buffers whose type is
RR-0103B	6.2	structures in chunks	Provide	efficient means of reading large data
RR-0590	5.2		Need clear,	efficient, standard support for mutual exclusion
RR-0241	5.2		Need easier and more	efficient support for mutual exclusion
RR-0401	2.2		/fixed-point operations cannot be done	efficiently because of accuracy requirements
RR-0117	8.2		Provide pre-	elaboratable constructs
AI-00421	12.2.1		Eliminate pragma	ELABORATE
RR-0095	13.4		units to be named in USE clauses and pragma	ELABORATE
RR-0396	12.2.1		ordering rules to reduce need for pragma	ELABORATE
RR-0767	12.2.1		problem without requiring the use of pragma	ELABORATE
RR-0581	12.2.1		Rules specifying the position of pragma	ELABORATE are error-prone and unhelpful

RR-0581C	13.4	name given in the context/	Allow a pragma	ELABORATE for a subunit to mention a package
RR-0546	12.2.1		It is too difficult to ensure that pragma	ELABORATE is used when it is needed
RR-0581A	12.2.1	Eliminate need for pragma ELABORATE; pragma NOT_		ELABORATE might help
RR-0004	12.2.1		Pragma	ELABORATE should be transitive
RR-0233	12.2.1		Pragma	ELABORATE should be transitive
RR-0581B	2.1		Clarify the effect of applying pragma	ELABORATE to a package that has no body
RR-0246	8.2		Ensure that constant declarations are not	elaborated at run time when initialized with/
RR-0018	6.4		Need pre-	elaborated constant arrays with variable-sized elements
RR-0245	8.2		Change Standard to encourage pre-	elaboration
RR-0285	8.2		Minimize the need for run-time	elaboration
RR-0261	2.3		Need compile-time warnings for access before	elaboration errors
RR-0244A	8.2		Require pre-	elaboration of some constructs
RR-0218	12.2.1		Make the implementation find a good library-unit	elaboration order
RR-0767	12.2.1	use of pragma ELABORATE	Solve the	elaboration order problem without requiring the
RR-0396	12.2.1	pragma ELABORATE	Add library unit	elaboration ordering rules to reduce need for
RR-0243	8.2		Allow/require	elaboration prior to run time
RR-0294	met		I/O packages are not suitable for	embedded applications; make Chapter 14 optional
RR-0188	6.1	and bit-wise logical operations on integer/		Embedded applications need unsigned integers
RR-0318	2.1		version of the Standard available (with	embedded mark-up) Make a machine-readable
RR-0286B	5.2		interrupts that are also used by the run-time/	Embedded system user may need access to
RR-0286A	5.2	control timer utilities		Embedded system users need the ability to
RR-0068	2.4		acknowledge that I/O support is optional for	embedded systems /Standard should explicitly
RR-0723	8.2		Need support for reconfiguration in	emergency cases
AI-00487	4.6		should not return TRUE when there is still an	empty line to be read /and END_OF_FILE
AI-00605	4.6	other GET/	GET_LINE skips terminators at the	end of the line, which is inconsistent with
AI-00211	13.4		Additional control statement to hop to	end of the loop
RR-0596	12.3.13		Allow END type_name to substitute for	END RECORD
RR-0673	12.3.13		Allow "END RECORD type_name" to substitute for	"END RECORD"
RR-0596	12.3.13		Allow	END type_name to substitute for END RECORD
AI-00487	4.6	is still an empty line to be/	END_OF_PAGE and	END_OF_FILE should not return TRUE when there
RR-0196	5.3			Endorsement of RR-0083
RR-0759	13.3		Add real-time and verification facilities for control	engineering
RR-0286C	5.2		Run-time system should avoid	entering privileged mode
RR-0454	11.1		Need	Entire function or attribute for real types
RR-0186	13.3		It is difficult to write an	entire operating system in Ada
RR-0128	4.1		Provide subprograms as parameters to subprograms and	entries
RR-0134	13.6		Require re-evaluation of entry count on abandoned	entries
RR-0408	4.4		There is a need for generic formal	entries
RR-0628	2.2.11		Need private task	entries
AI-00451	4.4		Task	entries as formal parameters to generics
RR-0488	4.4		Allow generic formal	entries as well as generic formal subprograms
RR-0075	5.2		Queue	entries by task priority or FIFO based on application
RR-0487	2.2.11		Need private task	entries for exclusive use within the task
RR-0421C	6.3		Need to associate interrupts with	entries of task objects, not task types
RR-0710	6.3	generated by operating system	Need to tie task	entries to asynchronous external events
RR-0090	2.2.11		Allow some task	entries to be visible, some not
RR-0771	9.3		Require tasks to have an accept for each	entry
RR-0217	13.1		Require that a parameter of an	entry be used within an accept
RR-0658	5.2		Allow accept statement possibility in a conditional	entry call
RR-0697	5.2		Allow	entry call alternative in selective wait
RR-0659	4.4		Need to make	entry call on a generic formal parameter
RR-0158	13.3		Allow multi-way conditional and timed	entry calls
RR-0498	5.2		with respect to accept statements and	entry calls Make selective wait symmetrical
RR-0076	5.2	alternatives based on/	Allow selection of	entry calls from entry queues and open
RR-0083	5.3		Provide asynchronous transfer of control via	entry call/selective wait construct
RR-0056	met		Do not remove task	entry families
RR-0216	9.3		Require that each task	entry have at least one accept statement
RR-0076	5.2		Allow selection of entry calls from	entry queues and open alternatives based on priorities
RR-0657	5.2		Order	entry queues based on priority
RR-0134	13.6		Require re-evaluation of	entry count on abandoned entries
RR-0415	5.2		Allow priority inheritance, prioritized	entry-queues, and prioritized selective wait
RR-0096A	12.2.3		Permit renaming an	enumeration literal as a character literal
RR-0359	4.6		Allow mixed case output for	enumeration literals
RR-0474	12.2.3		Need direct visibility to just	enumeration literals and operators of a type
RR-0131	13.4		/expression, should have visibility of the	enumeration literals of the qualifying type
AI-00378	12.2.3	visible by a subtype declaration		Enumeration literals should be made directly
RR-0187	2.4		Need to allow unsigned	enumeration representation specifications
RR-0239A	12.2.3		Renaming an	enumeration type should make literals visible

RR-0058	13.5.3	Allow discontinuous subtypes of	enumeration types	
RR-0437	13.5.3	Provide "supertype" capability for merging	enumeration types	
RR-0007	2.4	Default representation for	enumeration types should be specified	
RR-0465	2.2.14	Need a way to get the representation from an	enumeration value and vice versa	
RR-0040	2.2.14	Need a way to determine the internal coding of	enumeration values	
RR-0220	2.2.14	Need way to get the internal code associated with	enumeration values	
RR-0732	2.4	Clarify semantics of instantiating	ENUMERATION_IO with an integer type	
RR-0074	5.2	Define a standard run-time support	environment interface	
RR-0377	8.2	partitioning of programs for multiple processor	environments	Ada should allow
RR-0163	10.4	/support for variable-length strings with appropriate	equality and assignment operations	
RR-0694	12.2.3	Need easy direct visibility to the	equality operations	
RR-0652	12.2.3	Declaring a subtype should make the	equality operator directly visible	
RR-0008	12.3.9	Allow overloading of the	equality operator for all types	
RR-0025	12.3.9	Allow overloading of the	equality operator with different operand types	
RR-0066	2.3	Reduce risks associated with	erroneous execution/incorrect order dependences	
RR-0399	13.1	broad predefined exceptions, e.g., CONSTRAINT_	ERROR	Break up overly
RR-0497	13.7	generic actual can yield a surprising run-time	error	/default discriminants for types used as
RR-0699	13.3	an unaccepted length clause for a type as an	error	Do not treat
RR-0314	13.7	Define minimum-quality	error diagnostics in the standard	
RR-0135	13.4	Catenation should not raise CONSTRAINT_	ERROR for intermediate results	
RR-0583	2.1	Delete NUMERIC_	ERROR if now subsumed under CONSTRAINT_ERROR	
RR-0263	13.1	CONSTRAINT_	ERROR is too broadly defined	
RR-0118	4.2	Provide a user-specified storage reserve for STORAGE_	ERROR recovery	
RR-0120	4.2	Allow users to defer the signalling of STORAGE_	ERROR when space is exhausted	
RR-0275	2.2		Error-prone and counter-intuitive aspects of RENAMES	
RR-0581	12.2.1	Rules specifying the position of pragma ELABORATE are	error-prone and unhelpful	
RR-0165	2.3	constraint violations to be compile-time	errors	Allow parameter
RR-0242	2.3	Require compilation warnings for potential run-time	errors	
RR-0261	2.3	warnings for access before elaboration	errors	Need compile-time
RR-0426C	13.6	constraint in constant arrays causes programmer	errors	Omitting index
RR-0616	2.3	to diagnose statically-detectable constraint	errors	Require compilers
RR-0244B	2.3	Flag run-time	errors at compile-time when possible	
RR-0458	4.4	Need convenient way to	escape into weakly typed subprogram call	
RR-0586	4.4	/of the same generic unit may have to	evaluate their actual parameters in different orders	
RR-0700	13.1	Ensure that constant functions like sin(10.0) are	evaluated at compile-time	
RR-0134	13.6	Require re-	evaluation of entry count on abandoned entries	
RR-0710	6.3	Need to tie task entries to asynchronous external	events generated by operating system	
RR-0033A	4.5	Need to find the name of a raised	exception	
RR-0085	4.5	Need to get the name of the current	exception	
RR-0205	12.3.13	Allow program unit name on PRIVATE, BEGIN, and	EXCEPTION	
RR-0219	4.5	raised exception, including an out-of-scope	exception	/a way to get the name of the last
RR-0400	2.3	allow a task to die silently on an unhandled	exception	Do not
RR-0403	4.5	Need to be able to get the name of the current	exception	
RR-0407B	2.3	allow a task to die silently on an unhandled	exception	Do not
RR-0477	4.5	Provide a way to get the name and location of a raised	exception	
RR-0526C	4.5	Need to determine the name of a raised	exception	
RR-0621C	13.4	Allow case statements to dispatch on value of an	exception	
RR-0384	5.1	Cannot write subprogram which causes an	exception after specified delay	
RR-0444	13.4	Let the user limit the places where a given	exception can be raised	
RR-0005	4.4	code sharing unnecessarily difficult	Exception declarations in generic packages make	
RR-0765	13.1	Allow "when Package_Name.others =>" as	exception handler	
RR-0774F	2.2	Allow aliased exceptions within the same	exception handler	
RR-0221	13.4	Need to write common code for group of	exception handlers	
RR-0499	12.3.2	Like other "blocks", allow	exception handlers in accept statements	
RR-0621A	4.5	Need to find out which	exception has been raised	
AI-00450	5.3	Should allow raising of an	exception in another task	
RR-0651	5.3	Allow one task to raise an	exception in another task	
RR-0219	4.5	/a way to get the name of the last raised	exception, including an out-of-scope exception	
RR-0582	4.5	/implementation-dependent info about state when an	exception is raised	
RR-0145	4.5	Provide a way to get	exception name from WHEN OTHERS handlers	
RR-0772	4.5	Need to be able to get	exception name in a handler	
RR-0774G	4.5	Provide	exception name in OTHERS handler	
RR-0407A	4.5	where raised	exception name, line number, and unit name	
RR-0774H	4.5	Provide more predefined	exception names with finer granularity	
RR-0774E	4.5	Provide access to context of an	exception situation	
RR-0036	4.5	to be grouped under a single name by allowing	exception subtypes	Allow exceptions
RR-0209	2.3	Require the compiler to report certain-to-be-raised	exceptions	
RR-0228	4.4	Allow generic parameterization with	exceptions	

RR-0774J	4.4	Allow generic parameters for any Ada entity, e.g.,	exceptions
RR-0254	9.1	Too much freedom is allowed with respect to	exceptions and intermediate expression results
RR-0706	4.4	Allow	exceptions and packages as generic parameters
RR-0621B	4.4	Permit	exceptions as generic formals
RR-0671	4.4	Allow	exceptions as generic parameters
RR-0101B	4.4	Need to pass	exceptions as parameters to generic units and subprograms
RR-0526B	4.4	Need to pass	exceptions as parameters to generic units and subprograms
RR-0399	13.1	Break up overly broad predefined	exceptions, e.g., CONSTRAINT_ERROR
RR-0656	5.1	Need timed	exceptions for deadline scheduling
RR-0383	4.4	Need generic	exceptions for truly reusable generic units
RR-0376	13.3	Need special treatment of	exceptions in/
RR-0490	2.3	Need successful/convenient recovery from	exceptions in machine code insertions
RR-0416	4.5	Granularity of predefined	exceptions is too coarse
RR-0468	4.4	No generic way to handle	exceptions raised by generic formal subprograms
RR-0101A	4.5	Allow	exceptions to be grouped under a single name
RR-0526A	4.5	Allow	exceptions to be grouped under a single name
RR-0036	4.5	allowing exception subtypes	exceptions to be grouped under a single name by
RR-0646	13.2	read in handler	exceptions to be parameterized with parameters
RR-0033B	4.4	Need to pass	exceptions to subprograms and generic units
RR-0774F	2.2	Allow aliased	exceptions within the same exception handler
RR-0504	13.4	Add an	exchange operator
RR-0241	5.2	Need easier and more efficient support for mutual	exclusion
RR-0590	5.2	Need clear, efficient, standard support for mutual	exclusion
RR-0037	5.2	real-time clock	execute using simulated time rather than a
RR-0120	4.2	the signalling of STORAGE_ERROR when space is	exhausted
RR-0540	4.3	Allow a new package to build on an	existing package
RR-0491	13.1.2	Code would be clearer if one could	EXIT from a block statement
RR-0632	13.1.2	Allow	EXIT from a block statement for consistency
RR-0695	13.1.2	Allow	EXIT from block for legibility
RR-0132	12.3.4	on RAISE statement for consistency with	EXIT statement
RR-0538	9.3	Create new loop structure which bans the	EXIT statement
RR-0625	13.6	Change EXIT/WHEN to WHEN/	EXIT to parallel Ada IF and English
RR-0325B	13.6	Allow implementations to	experiment with supersets
RR-0274	2.1	The visibility rules could be	explained more clearly
RR-0638	13.1	Axioms for built-in operations should be specified	explicitly
RR-0068	2.4	optional for embedded/	explicitly acknowledge that I/O support is
RR-0024	11.1	decompose floating point numbers into mantissa/	exponent
RR-0680	13.1	Predefined exponentiation should take any integer type for	exponent
RR-0645	11.1	Need mantissa/	exponent extraction and manipulation
RR-0346	11.1	Need portable way to extract mantissa/	exponent from floating point number
RR-0492	11.1	Decouple mantissa and	exponent information in floating point type definitions
AI-00460	13.1	Allow non-integral powers for	exponentiation
RR-0680	13.1	Predefined	exponentiation should take any integer type for exponent
RR-0126	13.4	Allow underscore before "E" in	exponents
RR-0455	4.3	The import and	export mechanisms of Ada are too limited
RR-0172	4.3	Make import and	export of types easier
RR-0424	13.6	during instantiation	exported from an instance to be redefined
RR-0009	12.3.6	to static discrete type of static discrete	expression
RR-0650	13.5.2	statement choices, non-discrete case statement	expression
RR-0011	13.6	indeterminate form	Expression 0**0 should not be 1 as this is an
RR-0254	9.1	with respect to exceptions and intermediate	expression results
RR-0131	13.4	enumeration literals of the/	expression, should have visibility of the
RR-0099	12.3.6	Explicit type conversions should be allowed in static	expressions
RR-0246	8.2	at run time when initialized with static	expressions
RR-0519	13.1	Simplify overload rules for ambiguous/universal	expressions
RR-0705	2.2	performance, remove restrictions on static	expressions
RR-0452	13.4	Allow constant functions in static	expressions (or overloadable constants)
RR-0048	2.2.4	attributes of composite types	expressions to include representation
RR-0576	13.4	Allow parameter default	expressions to make use of previous IN parameters
RR-0420	4.6	Need file	"extend" or "append" capability
AI-00274	13.1	component visibility	extension of the USE clause — record
RR-0710	6.3	Need to tie task entries to asynchronous	external events generated by operating system
RR-0056	met	Do not remove task entry	families
RR-0111	8.1	Provide explicit support for	fault tolerance and recovery
RR-0136	6.1	Provide support for bit-	field operations such as shift, rotate
RR-0353	2.4	Unchecked conversion should eliminate compiler-dependent	fields
RR-0075	5.2	Queue entries by task priority or	FIFO based on application
RR-0405	4.6	Need convenient way to append to a	file

RR-0447	4.6	Need to be able to preserve/restore the default	file at any point
RR-0404	4.6	Need convenient way to find out if a particular	file exists
RR-0420	4.6	Need	file "extend" or "append" capability
RR-0382	4.6	Need to be able to rename and append to a	file in standard Ada
AI-00487	4.6	an empty line to be/ END_OF_PAGE and END_OF_	FILE should not return TRUE when there is still
RR-0159	4.6	Add standard package of general	file system functions
RR-0146	13.1	Support for	file/record locking
AI-00485	4.6	Having independent standard input and output	files is not useful for interactive I/O
RR-0626	6.2	are not portable among compilers, even for the/	Files produced by SEQUENTIAL_IO and DIRECT_IO
RR-0552	13.4	Need "padded" line input with truncation and pad-	fill to 'LENGTH
RR-0092	4.2	Allow user-specified	finalization
RR-0385	4.2	Need	finalization code for packages
RR-0203	4.2	Allow	finalization code for packages and tasks
RR-0168	4.2	Allow implicitly-invoked	finalization code for storage management
RR-0466	4.2	release of resources	finalization for objects of a type to ensure
RR-0523	4.2	release of resources	finalization for objects of a type to ensure
RR-0003	4.2	Provide a compiler-independent	finalization mechanism
RR-0019	4.2	use of collections	finalization procedures for safely controlling
RR-0676	4.2	Add	finalization to ensure release of resources
RR-0774H	4.5	Provide more predefined exception names with	finer granularity
RR-0642	13.4	Add label variables to support use of	finite state machines
RR-0249	12.1.2		First and 'last for null ranges are defined oddly
RR-0426D	13.4	Optional index in '	FIRST (and others) causes problems
AI-00518	13.4		Fixed and floating type declarations needlessly different
RR-0144	13.3	hardware is not present	fixed point arithmetic even if floating point
RR-0191	2.2	bounds of the type definition	Fixed point model numbers should include the
RR-0566	2.2	bounds of the type definition	Fixed point model numbers should include the
RR-0393	12.2.3	Can't get direct visibility of	fixed point mult and div operator by renaming
AI-00262	2.2.8	Real literals with	fixed point multiplication and division
RR-0204	2.1	Clarify which	fixed point operators are predefined
AI-00521	13.3		Fixed point subtypes should not inherit SMALL
RR-0252D	2.2	the range definition	Fixed point type should include the bounds of
RR-0256	13.1	not what is needed	Fixed-point approach with range and delta is
RR-0357	10.1	Need packed decimal, wide-ranging	fixed-point, decimal deltas
RR-0591	2.2.8	Allow	fixed-point multiply/divide with universal real operands
RR-0401	2.2	efficiently because of accuracy/	fixed-point operations cannot be done
RR-0744	2.2.12	Allow for loop to have non-discrete (fixed-point) parameter
RR-0733	13.5	Need	fixed-point types not centered on zero
RR-0244B	2.3		Flag run-time errors at compile-time when possible
RR-0061	2.4	Make Long_	Float and Short_Float required types
RR-0537	13.6	Separate integer divide and	floating divide as in Pascal
RR-0144	13.3	Require support for fixed point arithmetic even if	floating point hardware is not present
AI-00609	11.1	fully characterize machine characteristics	Floating point machine attributes inadequate to
RR-0731	11.1	Arithmetic Standard as a basis for Ada's	floating point model /the Language Compatible
RR-0252E	11.1	machine architecture	floating point model that reflects actual
RR-0255	11.1	Provide a function for returning the value of the next	floating point number
RR-0346	11.1	Need portable way to extract mantissa/exponent from	floating point number
RR-0024	11.1	Need a way to decompose	floating point numbers into mantissa/exponent
RR-0636	11.1	Improve Ada's axioms for	floating point operations
RR-0252C	11.1	Ensure programmer can choose appropriate	floating point representation
RR-0225	11.1	accuracy is used	floating point representation with desired
RR-0564	11.1	Implementation freedom to include more mantissa digits in	floating point safe numbers
RR-0252A	11.1	Ensure support for IEEE	floating point standard; allow full use of machine/
RR-0369	11.1	Provide support for	floating point standard IEEE-754
RR-0492	11.1	Decouple mantissa and exponent information in	floating point type definitions
AI-00291	4.4	Can't define a generic package that works for all	floating point types
AI-00518	13.4	Fixed and	floating type declarations needlessly different
RR-0189	11.1	Standard should include a	floating-point math library interface
RR-0720	11.1	hardware architectures	Floating-point model should reflect actual
RR-0664	12.3.1	Need 'IMAGE and 'VALUE attributes for	floating-point types
RR-0358	11.1	Need support for	floor, ceiling, truncate, and whole operations
RR-0535	11.1	Provide CEILING and	FLOOR numeric operators
RR-0408	4.4	There is a need for generic	formal entries
RR-0488	4.4	Allow generic	formal entries as well as generic formal subprograms
RR-0584	4.4	is given	formal generic subtypes when an instantiation
RR-0486	4.4	Allow generic formal task types as well as generic	formal limited types
RR-0375	13.7	Include	formal memory protection/security
RR-0659	4.4	Need to make entry call on a generic	formal parameter

RR-0395	2.2		Include	formal parameter names in parameter/result-type profile	
RR-0600	2.2		Allow	formal parameter names in parameter/result-type profile	
AI-00452	4.4		Allow record types as generic	formal parameters	
AI-00478	12.3.10		Allow reading of OUT	formal parameters	
RR-0714	12.3.8		Allow default names for all generic	formal parameters	
AI-00451	4.4		Task entries as	formal parameters to generics	
AI-00404	2.2		Use of incomplete private types in generic	formal part	
RR-0462	12.3.7		Allow selected component form of type mark in a	formal part even when the selected component/	
RR-0579	12.3.7		Allow a type mark of form P.FOO in the	formal part of a subprogram named FOO	
RR-0722	4.4		Need generic	formal record types	
RR-0169	13.4		Allow "null" procedures for actual or default generic	formal subprogram values	
RR-0468	4.4		way to handle exceptions raised by generic	formal subprograms	No generic
RR-0488	4.4		Allow generic formal entries as well as generic	formal subprograms	
RR-0486	4.4	limited types	Allow generic	formal task types as well as generic formal	
RR-0627	4.4		Allow partial match to	formal type for records	
RR-0006	4.4		Distinguish unconstrained/constrained generic	formal types	
RR-0472	4.4		Distinguish unconstrained/constrained generic	formal types	
RR-0622	2.1		should use "metatype" in describing generic	formal types	The Standard
RR-0621B	4.4		Permit exceptions as generic	formals	
RR-0445	4.4		Non-staticness of generic	formals poses problems	
RR-0481	2.1		Make Ada documentation available in SGML	format	
RR-0361	4.6		number of options for controlling the output	format of numbers	Increase the
RR-0360	10.4		Add picture-	formatting capabilities to TEXT_IO	
RR-0039	11.2		Make it easier to access	FORTRAN libraries	
AI-00609	11.1		Floating point machine attributes inadequate to	fully characterize machine characteristics	
RR-0207	4.6		Add TEXT_IO support with Exists	function and Append procedure	
RR-0251	13.6		Invent new notations to distinguish	function call, array reference, and conversions	
RR-0708	13.5		Allow infix	function calls	
AI-00223	5.1		Require adequate resolution for the	function CLOCK	
RR-0255	11.1	floating point number	Provide a	function for returning the value of the next	
RR-0347	5.2		control; allow task priority to increase as a	function of lack of service	Under program
RR-0454	11.1		Need Entire	function or attribute for real types	
RR-0453	11.1	numeric value	Provide a special	function or attribute yielding the sign of a	
RR-0026	13.4.3		Permit	function parameters to have modes IN OUT and OUT	
RR-0598	13.4.3		Permit	function parameters to have modes OUT and IN OUT	
RR-0427	12.1.1		Do not permit a	function to return a locally-declared task object	
RR-0629	4.1		Need procedure and	function types for use in subprogram calls	
RR-0597	4.6		Need	functional version of GET_LINE instead of procedural	
RR-0047	4.6		Add TEXT_IO.GET	functions	
RR-0051C	10.4		Provide packages for string edit	functions	
RR-0063	5.3		from being aborted while performing critical	functions	Protect tasks
RR-0130	4.6		Replace DEFAULT_xy variables in Chapter 14 by	functions	
RR-0159	4.6		Add standard package of general file system	functions	
RR-0620	13.6		Ban RETURN statement except inside	functions	
RR-0674	13.4.1		Allow user-defined attributes as	functions	
RR-0774B	13.6		Tasking defined as a standard package of	functions	
RR-0489	13.1.1		Allow machine-code insertions in	functions as well as procedures	
RR-0691	13.1.1		Allow machine-code insertions in	functions as well as procedures	
RR-0348	11.1		Need predefined	functions for real numbers, e.g., trig, log, etc	
RR-0452	13.4	overloadable constants)	Allow constant	functions in static expressions (or	
RR-0700	13.1		Ensure that constant	functions like sin(10.0) are evaluated at compile-time	
RR-0020	5.2	so priorities should be/	Relative importance of	functions may change during program execution,	
RR-0719	11.1		Need standard for trig	functions, sqrt, etc	
RR-0524	6.4	objects; allow programmer to ensure pass/	Allow	functions to return references to components of	
RR-0476	13.6		Allow user-written type-conversion	functions with the same name as the target type	
RR-0439	4.2		Require automatic	garbage collection	
RR-0643	4.2	encourage its use		Garbage collection can now be done well;	
RR-0482	4.3		Multiple derived types from same package do not	generate needed operations	
RR-0710	6.3		task entries to asynchronous external events	generated by operating system	Need to tie
RR-0585	4.4		Need pragma to specify code-	generation strategy for generic instantiation	
RR-0027	4.4		Improve generics so a generic report	generator could be written	
RR-0497	13.7		/of default discriminants for types used as	generic actual can yield a surprising run-time/	
RR-0342	4.4		Do not implement requests that will break	generic code sharing	
RR-0693	2.2		Parameter passing rules for scalars makes	generic code sharing hard	
RR-0383	4.4		Need	generic exceptions for truly reusable generic units	
RR-0408	4.4		There is a need for	generic formal entries	
RR-0488	4.4	formal subprograms	Allow	generic formal entries as well as generic	
RR-0486	4.4		Allow generic formal task types as well as	generic formal limited types	

RR-0659	4.4	Need to make entry call on a	generic formal parameter
AI-00452	4.4	Allow record types as	generic formal parameters
RR-0714	12.3.8	Allow default names for all	generic formal parameters
AI-00404	2.2	Use of incomplete private types in	generic formal part
RR-0722	4.4	Need	generic formal record types
RR-0169	13.4	Allow "null" procedures for actual or default	generic formal subprogram values
RR-0468	4.4	No generic way to handle exceptions raised by	generic formal subprograms
RR-0488	4.4	Allow generic formal entries as well as	generic formal subprograms
RR-0486	4.4	formal limited types	generic formal task types as well as generic
RR-0006	4.4	Allow	generic formal types
RR-0472	4.4	Distinguish unconstrained/constrained	generic formal types
RR-0622	2.1	Distinguish unconstrained/constrained	generic formal types
RR-0621B	4.4	The Standard should use "metatype" in describing	generic formal types
RR-0445	4.4	Permit exceptions as	generic formals
RR-0055	12.4.1	Non-staticness of	generic formals poses problems
RR-0364	12.4.1	Allow a subprogram body to be defined by renaming or	generic instantiation
RR-0550	12.4.1	Allow a subprogram body to be defined by	generic instantiation
RR-0585	4.4	Allow subprogram bodies to be defined by RENAMES or	generic instantiation
RR-0666	12.4.1	Need pragma to specify code-generation strategy for	generic instantiation
RR-0470	12.4.1	Allow a subprogram body to be given by	generic instantiation
RR-0608	13.3	Allow renaming or	generic instantiation to define a subprogram body
AI-00291	4.4	Allow recursive	generic instantiations
RR-0005	4.4	Can't define a	generic package that works for all floating
RR-0228	4.4	Exception declarations in	generic packages make code sharing unnecessary/
RR-0227	4.4	Allow	generic parameterization with exceptions
RR-0505B	4.4	Allow partial match for records as	generic parameterization with static numeric quantities
RR-0671	4.4	Allow exceptions as	generic parameters
RR-0706	4.4	Allow exceptions and packages as	generic parameters
RR-0774J	4.4	Allow	generic parameters
RR-0027	4.4	Improve generics so a	generic parameters for any Ada entity, e.g., exceptions
RR-0562	4.4	Require separate compilation of	generic report generator could be written
AI-00382	2.2	Allow	generic specifications and bodies
RR-0606	13.5.4	Allow	generic subprogram bodies
RR-0426B	2.2	Allow declaration and body to be combined for	generic subprogram names to be overloaded
RR-0547	2.2	allow merge of specification/body for	generic subprograms
RR-0604	2.2	allow merge of specification/body for	generic subprograms /non-generic subprograms,
RR-0547	2.2	specification/body for generic/	generic subprograms, allow merge of
RR-0604	2.2	specification/body for generic/	generic subprograms, allow merge of
RR-0584	4.4	Like non-	generic subtypes when an instantiation is given
RR-0484	4.6	Need stricter checking of formal	generic TEXT_IO packages
RR-0446	4.4	Add DEFAULT_xy functionality as parameters to	generic types
RR-0190	4.4	by distinguishing constrained/unconstrained	Tighten the contract model
RR-0511	4.4	Allow use of a base type within a	generic unit
RR-0548	13.4	Allow use of a base type within a	generic unit
RR-0712	4.4	Allow convenient syntax for instantiating a nested	generic unit
RR-0483	12.3.7	declare double precision numeric types within a	generic unit
RR-0586	4.4	/subprogram to have the same identifier as the	Need ability to
RR-0033B	4.4	Different instantiations of the same	generic unit (as is allowed for package/
RR-0383	4.4	Need to pass exceptions to subprograms and	generic unit may have to evaluate their actual/
RR-0101B	4.4	Need generic exceptions for truly reusable	generic units
RR-0526B	4.4	Need to pass exceptions as parameters to	generic units
RR-0035	13.5.4	Allow	generic units and subprograms
RR-0468	4.4	generic formal subprograms	generic units and subprograms
RR-0174	4.3	No	generic units to be overloaded
AI-00451	4.4	Allow packages to be	generic way to handle exceptions raised by
RR-0713	4.4	Task entries as formal parameters to	generic with respect to concurrency protection
RR-0027	4.4	Relax array matching rules for	generics
RR-0283	4.3	Improve	generics
RR-0618	13.1	Need convenient way to set	generics so a generic report generator could be written
RR-0116	5.2	Ban	global compilation parameters
RR-0192	5.2	User-modifiable priorities needed for mode change and	GOTO statement
RR-0300	13.2	to change priorities during mode change and for	graceful degradation
RR-0148	3.1	Use an LR	graceful degradation
RR-0746	13.7	Provide support for extended and	grammar to define the syntax of the language
RR-0390	3.1	Allow pictures/	graphic characters (256 ASCII set)
RR-0101A	4.5	Need 8-bit unsigned CHARACTER for Greek and	graphics as comments in source code
RR-0526A	4.5	Allow exceptions to be	graphics symbols
RR-0036	4.5	exception subtypes	grouped under a single name
		Allow exceptions to be	grouped under a single name
		Allow exceptions to be	grouped under a single name by allowing

RR-0468	4.4	No generic way to	handle exceptions raised by generic formal subprograms
RR-0286D	6.3	Interrupts should be	handled with a procedure model, not a task model
RR-0646	13.2	to be parameterized with parameters read in	handler
RR-0765	13.1	Allow "when Package_Name.others =>" as exception	handler
RR-0772	4.5	Need to be able to get exception name in a	handler
RR-0774F	2.2	Allow aliased exceptions within the same exception	handler
RR-0774G	4.5	Provide exception name in OTHERS	handler
RR-0145	4.5	Provide a way to get exception name from WHEN OTHERS	handlers
RR-0221	13.4	Need to write common code for group of exception	handlers
RR-0499	12.3.2	Like other "blocks", allow exception	handlers in accept statements
RR-0316	6.3	Improve interrupt	handling, e.g., with interrupt procedures
RR-0115	6.3	Provide better interrupt	handling model
RR-0738	7.3	Add facilities to support vector processing	hardware
RR-0107	5.1	Allow application to specify clock timing interval if	hardware allows this flexibility
RR-0720	11.1	Floating-point model should reflect actual	hardware architectures
RR-0144	13.3	fixed point arithmetic even if floating point	hardware is not present
RR-0087	6.3	Allow software priorities to match/exceed	hardware priorities
AI-00570	12.1.1	Releasing	heap storage associated with task type instances
RR-0702	4.2	There is a need for improvements in	heap storage management
RR-0109	8.1	Ada program Provide Ada semantics that are	helpful when dealing with a single distributed
RR-0071	13.2	Improve support for	heterogeneous distributed processing
RR-0372	13.2	Solve problem where	heterogeneous processors view memory differently
RR-0558	13.4	Deriver of type should be able to	hide subset of derived operations
RR-0229	13.4	value of an object to ensure these/ Need to	hide the range of a scalar type and the initial
RR-0282	13.3	Ada program structure	hides important context information
RR-0588	13.4	Provide a form of USE clause that	hides outer homographs
RR-0402	4.3	Need unique	hierarchical pathnames for subunit
RR-0442	4.3	Extend Ada to allow a package type	hierarchy
RR-0588	13.4	Provide a form of USE clause that hides outer	homographs
AI-00211	13.4	Additional control statement to	hop to end of the loop
RR-0500	2.1	More terms should be	hyphenated to improve clarity
RR-0483	12.3.7	/an instantiated subprogram to have the same	identifier as the generic unit (as is allowed/
RR-0462	12.3.7	even when the selected component has the same	identifier as the subprogram /in a formal part
RR-0380	7.2	Need a task	identifier for every task
RR-0675	12.3.7	Allow a subprogram	identifier to be used as a type mark in its specification
RR-0330	3.1	Allow national characters in literals, comments, and	identifiers
RR-0707	2.2.6	Need same-name component	identifiers in different variants
RR-0252A	11.1	machine characteristics Ensure support for	IEEE floating point standard; allow full use of
RR-0369	11.1	Provide support for floating point standard	IEEE-754
RR-0664	12.3.1	Need '	IMAGE and 'VALUE attributes for floating-point types
RR-0495	13.6	Remove leading space in the result of the '	IMAGE attribute for integers
RR-0363	12.3.1	discrete types Allow 'VALUE and '	IMAGE to apply to real types as well as
RR-0602	met	Encourage	implementors to support standardized libraries
RR-0692	2.3	/to cause unsuccessful compilation if restrictions	implied by the pragmas are not obeyed
RR-0455	4.3	The	import and export mechanisms of Ada are too limited
RR-0172	4.3	Make	import and export of types easier
RR-0020	5.2	Relative	importance of functions may change during
RR-0282	13.3	Ada program structure hides	important context information
RR-0421D	6.3	/timed, or conditional calls may depend	inappropriately on the run-time system
RR-0690	12.4.2	subtype declaration Allow	incomplete and private types to be completed by
AI-00327	2.2.5	Instantiating with an	incomplete private type
AI-00404	2.2	Use of	incomplete private types in generic formal part
RR-0259	13.7	Incomplete type declarations are dangerous and unnecess/	incomplete typing for types other than access
RR-0098	13.4	or private Generalize	incompletely declared private type
RR-0577	2.2	/constant of composite type having a component of an	increment of something other than one in for loops
RR-0743	2.2.12	Need to allow	indeterminate form
RR-0011	13.6	Expression O**O should not be 1 as this is an	index
RR-0133	7.2	Allow a task component of an array to get its	index bounds are determined by context
RR-0571A	12.2.5	/use of OTHERS choice with named associations when	index constraint
RR-0571B	2.1	is outside the range of the applicable	/the choice in an aggregate
RR-0426C	13.6	programmer errors Omitting	index constraint in constant arrays causes
RR-0029	12.2.5	/use of OTHERS with named associations when the	index constraint is determined by context
RR-0426D	13.4	Optional	index in 'FIRST (and others) causes problems
RR-0749	12.3.11	parameters and as values in/ Should allow	index sliding for slices serving as actual
RR-0755	2.2.13	Allow "[" instead of "(" for	indexed components
RR-0122	2.2	to reject some integer types as array	indexes
RR-0510	2.2.10	Re-	Permit an implementation
RR-0315	2.4	to improve/ Allow integer type names that	indexing arrays via type conversions
			indicate representation size, e.g., INTEGER 32,

RR-0573	12.3.11	component initialization and as/	Slide	indices of array aggregates for record
RR-0515	4.2	especially in/	Need ability to request	indivisible update for specific objects,
RR-0544	4.2		Need	indivisible update on reference counts
RR-0708	13.5		Allow	infix function calls
RR-0057	12.2.3		Need direct visibility to	infix operators in another package
AI-00521	13.3		Fixed point subtypes should not	inherit SMALL
RR-0525	4.3	Extend Ada to allow for polymorphism and		inheritance
RR-0599	4.3	Certain changes to derived/private types will help		inheritance
RR-0750	4.3		Add support for	inheritance and polymorphism to the language
RR-0193	5.2		Allow priority queues, priority	inheritance, and prioritized treatment of open select/
RR-0072	5.2		Prioritized queues and priority	inheritance are needed for real-time applications
RR-0662	4.3		Need package classes and	inheritance for object-oriented programming
RR-0021	5.2		Need priority	inheritance for server tasks
RR-0125	4.3		Introduce object-oriented	inheritance into the language
RR-0415	5.2	prioritized selective wait	Allow priority	inheritance, prioritized entry-queues, and
RR-0223	4.3		Need to add	inheritance to support object-oriented programming
RR-0567	2.2	Allow variable declaration to get constraints from		initial value
RR-0229	13.4	Need to hide the range of a scalar type and the		initial value of an object to ensure these/
RR-0350	2.1	Clarify wording dealing with default		initial values
RR-0573	12.3.11	/of array aggregates for record component		initialization and as components of record/
RR-0677	2.2.2		Allow	initialization clauses on scalar type declarations
RR-0595	2.2.2		Allow default	initialization for all types
RR-0649	2.2.2		Allow default	initialization for all types (not just records)
RR-0161	2.2.2		Allow default	initialization for any non-limited type
RR-0639	8.2		Need compile-time	initialization of complex data structures
RR-0456	2.2.2		Allow	initialization to be associated with a type definition
RR-0506	2.2.2		Allow	initialization to be associated with a type definition
RR-0230	2.2.2		Allow	initialization to be associated with any type definition
RR-0129	2.2.2	non-limited type	Allow default	initialization to be specified for any
RR-0123	7.2		Provide	initialization values to tasks at startup
RR-0086	13.4	the record itself	Need to	initialize a record component to the address of
AI-00479	12.3.10			Initialize access type OUT parameters to null
RR-0247	13.6		Don't	initialize access variables by default to NULL
RR-0559	13.6	If allow reading of OUT parameters,		initialize OUT access to NULL
RR-0291	6.4	use of an address clause causes storage to be		initialized
RR-0246	8.2	/are not elaborated at run time when		initialized with static expressions
RR-0208	13.4	operations without waiting for/	Need ability to	initiate TEXT_IO, DIRECT_IO, and SEQ_IO
RR-0398	2.2.9	Need clearer/more selective rules for pragma		INLINE applicability
RR-0284	13.1.1	Machine-code insertions are unreadable; replace with		INLINE macros
RR-0687	2.2.9		Pragma	INLINE should not apply to all overloads; only closest
RR-0740	2.2	For optimization with respect to		inlined subprograms, allow merging of scopes
RR-0575	2.2.9	Need better (more selective) control over		inlining
RR-0060	2.2.9	call sites	Allow	inlining of subprograms from some but not all
RR-0554	9.1	for target of Unchecked_Conversion and I/O	input	Need constraint checks
AI-00485	4.6	interactive I/O	Having independent standard	input and output files is not useful for
RR-0485	4.6		Provide means to get the line length of an	input or output device
RR-0552	13.4		Need "padded" line	input with truncation and pad-fill to 'LENGTH
RR-0235	4.6		Need support for interactive terminal	input/output
RR-0149	4.6		Provide a keyboard	input/output package
AI-00570	12.1.1	Releasing heap storage associated with task type		instances
RR-0483	12.3.7	identifier as the generic unit (as is/	Allow an	instantiated subprogram to have the same
RR-0548	13.4		Allow convenient syntax for	instantiating a nested generic unit
RR-0732	2.4		Clarify semantics of	instantiating ENUMERATION_IO with an integer type
AI-00327	2.2.5			Instantiating with an incomplete private type
RR-0055	12.4.1	body to be defined by renaming or generic	instantiation	Allow a subprogram
RR-0364	12.4.1	Allow a subprogram body to be defined by generic	instantiation	
RR-0424	13.6	from an instance to be redefined during	instantiation	Allow names exported
RR-0550	12.4.1	bodies to be defined by RENAMES or generic	instantiation	Allow subprogram
RR-0585	4.4	to specify code-generation strategy for generic	instantiation	Need pragma
RR-0666	12.4.1	Allow a subprogram body to be given by generic	instantiation	
RR-0584	4.4	checking of formal generic subtypes when an	instantiation is given	Need stricter
RR-0470	12.4.1	Allow renaming or generic	instantiation to define a subprogram body	
RR-0608	13.3	Allow recursive generic	instantiations	
RR-0586	4.4	have to evaluate their actual/	Different	instantiations of the same generic unit may
RR-0530	13.3			Insufficient support for mutants of limited types
RR-0409	2.4	Define in the language how 3.5 rounds to	integer	
RR-0635	13.4	Provide basic support for extended precision	integer arithmetic	
RR-0332	6.1		Provide unsigned	integer capability

RR-0537	13.6	Separate	integer divide and floating divide as in Pascal
RR-0045	2.4	Allow/require extended precision for intermediate	integer results
RR-0732	2.4	of instantiating ENUMERATION_IO with an	integer type
RR-0680	13.1	Predefined exponentiation should take any	integer type for exponent
RR-0315	2.4	size, e.g., INTEGER_32, to improve/	integer type names that indicate representation
RR-0188	6.1	integers and bit-wise logical operations on	integer types
RR-0433	6.1	There is a need for predefined unsigned	integer types
RR-0460	6.1	Ada needs to provide support for unsigned	integer types
RR-0572	13.1	operators with respect to all predefined	integer types
RR-0122	2.2	Permit an implementation to reject some	integer types as array indexes
RR-0315	2.4	/type names that indicate representation size, e.g.,	INTEGER_32, to improve portability
RR-0138	6.1	Need full-sized unsigned	integers
RR-0495	13.6	space in the result of the 'IMAGE attribute for	integers
RR-0633	6.1	Provide logical operations (e.g., XOR) for	integers
RR-0634	6.1	Provide arithmetic shift operations for	integers
RR-0188	6.1	Embedded applications need unsigned	integers and bit-wise logical operations on integer/
RR-0766	6.1	Allow bit-wise operations (AND, SHIFT) on	integers, bytes, etc
AI-00600	6.1	Why we need unsigned	integers in Ada
RR-0044	13.2	There is no need to add unsigned	integers to Ada
RR-0721	6.1	Try to add unsigned	integers to the language
AI-00460	13.1	Allow non-	integral powers for exponentiation
AI-00485	4.6	input and output files is not useful for	interactive I/O
AI-00488	4.6	terminators in GET routines causes problems in	interactive I/O
RR-0235	4.6	Need support for	interactive terminal input/output
RR-0074	5.2	Define a standard run-time support environment	interface
RR-0189	11.1	Standard should include a floating-point math library	interface
RR-0527	4.1	Standardize information/conventions used for pragma	INTERFACE
RR-0177	4.3	configuration management	interface between compiler and library for
RR-0175	5.2	run-time system aspects	interface between compiler- and target-specific
RR-0582	4.5	implementation-dependent info/	interface for getting additional
RR-0479	13.1	Need standard subprograms to get user-	interface information from OS
RR-0162	13.1	Provide a clean	interface to a SORT package
RR-0345	13.1	Need standardized	interface to other ANSI languages
RR-0774L	13.1	Allow pragma	INTERFACE within a package body
RR-0254	9.1	/much freedom is allowed with respect to exceptions and	intermediate expression results
RR-0045	2.4	Allow/require extended precision for	intermediate integer results
RR-0135	13.4	Catenation should not raise CONSTRAINT_ERROR for	intermediate results
RR-0220	2.2.14	Need way to get the	internal code associated with enumeration values
RR-0040	2.2.14	Need a way to determine the	internal coding of enumeration values
RR-0459	2.4	Improve support for	interoperability; lessen implementation dependence
RR-0421A	6.3	Need to delay in processing an	interrupt
RR-0195	6.3	Need	interrupt address per task, not task type
RR-0421B	6.3	different from memory address structure; a/	Interrupt address structure is sometimes
RR-0349	6.3	conceptually different and should not be/	Interrupt addresses and memory addresses are
RR-0768	5.3	Need to asynchronously	interrupt another task to stop it
RR-0735	6.3	Need ability to change	interrupt bindings at run-time
RR-0316	6.3	Improve	interrupt handling, e.g., with interrupt procedures
RR-0115	6.3	Provide better	interrupt handling model
RR-0316	6.3	Improve interrupt handling, e.g., with	interrupt procedures
RR-0151	6.3	Need standard support for priority	interrupts
RR-0421D	6.3	calls may depend/	interrupts as ordinary, timed, or conditional
RR-0686	6.3	The treatment of	interrupts higher than normal tasks is ill-conceived
RR-0179	6.3	Priority of	interrupts is too implementation-dependent
RR-0286D	6.3	The treatment of	Interrupts should be handled with a procedure
RR-0286B	5.2	model, not a task model	interrupts that are also used by the run-time system
RR-0421C	6.3	Embedded system user may need access to	interrupts with entries of task objects, not
RR-0665C	5.4	task types	intertask communication
RR-0183	5.4	Need to associate	inter-task communication is not available
RR-0107	5.1	Support message-driven	interval if hardware allows this flexibility
RR-0275	2.2	Asynchronous	intuitive aspects of RENAMES
RR-0251	13.6	Allow application to specify clock timing	Invent new notations to distinguish function
AI-00329	4.6	Error-prone and counter-	IO
ZRR-0164	4.6	call, array reference, and conversions	IO
RR-0360	10.4	Look-ahead operation for TEXT_	IO
RR-0593	4.6	Provide multitasking terminal I/O in TEXT_	IO
RR-0626	6.2	Add picture-formatting capabilities to TEXT_	IO
RR-0208	13.4	of variant record I/O in DIRECT_IO/SEQUENTIAL_	IO
RR-0626	6.2	compilers, even/	IO and DIRECT_IO are not portable among
		Files produced by SEQUENTIAL_	IO, and SEQ_IO operations without waiting for/
		Need ability to initiate TEXT_IO, DIRECT_	IO are not portable among compilers, even for/
		Files produced by SEQUENTIAL_IO and DIRECT_	

RR-0208	13.4	waiting for/	Need ability to initiate TEXT_	IO, DIRECT_IO, and SEQ_IO operations without
RR-0333	13.3		More precise definition of TEXT_	IO is needed, less implementation freedom
RR-0208	13.4	/to initiate TEXT_IO, DIRECT_IO, and SEQ_	functionality as parameters to generic TEXT_	IO operations without waiting for completion
RR-0484	4.6		Add TEXT_	IO packages Add DEFAULT_xy
RR-0207	4.6		LOW_LEVEL_	IO support with Exists function and Append procedure
RR-0297	13.4		Clarify semantics of instantiating ENUMERATION_	IO was a bad idea; remove this package from the language
RR-0732	2.4		Need assignment capability for TEXT_	IO with an integer type
RR-0551	4.6		Add TEXT_	IO.FILE_TYPE
RR-0047	4.6	like PUT)	Create TEXT_	IO.GET functions
RR-0295	4.6		Mandate implementation of variant record I/O in DIRECT_	IO.PUT_LINE for types other than string (make
RR-0593	4.6		Add support for	IO/SEQUENTIAL_IO
RR-0147	13.1		Ada should use	ISAM
RR-0034	3.1		Use ISO symbols and standards in the Ada	ISO 8859/1-9 (8-bit) character set
AI-00510	3.1		a record component to the address of the record	ISO Standard
RR-0086	13.4		Distinguish storage classes for variables with	itself Need to initialize
RR-0271	13.6		Provide a	key words like CONTROLLED or STATIC
RR-0149	4.6		Replace	keyboard input/output package
RR-0397	13.6		Add	keyword PRAGMA with something capturing meaning/
RR-0642	13.4		task priority to increase as a function of	label variables to support use of finite state machines
RR-0347	5.2		Ensure that there are no storage	lack of service /under program control; allow
RR-0113	4.2		Ensure the use of unconstrained actual types is always	"leaks"
RR-0549	4.4		line input with truncation and pad-fill to '	legal
RR-0552	13.4		Do not treat an unaccepted	LENGTH Need "nadded"
RR-0699	13.3	number of bits	Provide means to get the line	length clause for a type as an error
RR-0417	6.2		Need to pack variable-	Length clause should force allocation of EXACT
RR-0485	4.6		Do not add variable	length of an input or output device
RR-0773	6.2		Add varying	length records into a block for data transmission
RR-0054	13.2		Add some form of support for varying	length strings to the language
RR-0327	10.4		Need support for variable-	length strings to the language
RR-0419	10.4		exception can be raised	length strings with appropriate equality and assignment/
RR-0163	10.4		Make it easier to access FORTRAN	Let the user limit the places where a given
RR-0444	13.4		Problems with name clashes with big program	libraries
RR-0039	11.2		Encourage implementors to support standardized	libraries
RR-0178	4.3		Add	libraries for array processing
RR-0602	met		of names to be restricted within a program	library Allow visibility
RR-0308	11.1		Allow overloaded names in the	library
RR-0073	4.3	those provided by the compiler/	Ensure the	library can be manipulated by tools other than
RR-0774D	13.1		Standardize interface between compiler and	library for configuration management
RR-0368B	4.3		Standard should include a floating-point math	library interface
RR-0177	4.3		Can't restart	library level tasks
RR-0189	11.1		Need standardized support for improved	Library level tasks can't terminate
RR-0370B	8.2		Make separate compilation independent of a particular	library management capabilities
RR-0370C	2.1		Clarify termination of tasks dependent on	library model
RR-0226	4.3		Require TERMINATE alternative to terminate	library packages
RR-0237	4.3		subunits with respect to a common ancestor	library tasks
RR-0215	2.1		name given in the context clause of a parent	library unit Allow overloaded
RR-0023	2.1		reduce need for pragma ELABORATE	library unit /a subunit to mention a package
RR-0041	4.3		Add	library unit elaboration ordering rules to
RR-0581C	13.4		Extend control of	library unit visibility
RR-0396	12.2.1	library units	Structure library units as groups, control visibility of	library units
RR-0774C	4.3		Clarify termination of tasks whose masters are	library units
RR-0457	4.3		Structure	library units as groups, control visibility of
RR-0496	2.1		Can't recover space declared in	library units when reconfiguring a system
RR-0457	4.3		Allow	library-level declarations to be defined by RENAMES
RR-0370A	8.2		Make the implementation find a good	library-unit elaboration order
RR-0601	2.2		Provide better support for	"light-weight" parallelism (as in Linda)
RR-0218	12.2.1		The import and export mechanisms of Ada are too	limited
RR-0747	13.6		Decouple = and /=; do not distinguish private from	limited private
RR-0455	4.3		Need user-defined assignment operator for	limited private type
RR-0670	13.6		Out-mode parameters of	limited private types should be allowed
RR-0184	4.2		initialization to be specified for any non-	limited type Allow default
RR-0578	2.2.3		Allow default initialization for any non-	limited type
RR-0129	2.2.2		Need "semi."	limited type with predefined := but no predefined =
RR-0161	2.2.2		Allow user-defined assignment for	limited type*
RR-0392	13.5		Allow user-defined assignment for	limited types
RR-0070	4.2		Allow overloaded = for all types, not just	limited types
RR-0160	4.2			
RR-0412	12.3.9			

RR-0486	4.4	formal task types as well as generic formal	limited types	Allow generic
RR-0530	13.3	Insufficient support for mutants of	limited types	
RR-0272	13.6		Limited types are of little true value	
RR-0001	4.2		Limited types need assignment, constants	
RR-0202	4.2	Relax parameter mode rules for	limited types that have an assignment operation	
RR-0182	8.1	different processors	limits for parts of a program running on	
RR-0747	13.6	Define visibility	Linda)	Provide better
RR-0553	4.6	support for "light-weight" parallelism (as in	LINE	
RR-0355	2.4	GET_LINE should not automatically call SKIP_	line arguments	
RR-0295	4.6	Standardize means of getting the OS command	LINE for types other than string (make like PUT)	
RR-0552	13.4	Create TEXT_IO.PUT_	line input with truncation and pad-fill to 'LENGTH	
RR-0709	2.4	Need "padded"	line inputs	
RR-0597	4.6	Need more portability in getting command	LINE instead of procedural	
RR-0485	4.6	Need functional version of GET_	line length of an input or output device	
RR-0407A	4.5	Provide means to get the	line number, and unit name where raised	
RR-0681	13.7	Need exception name,	Line Of Code (LOC) should be standardized	
RR-0553	4.6	A definition of an Ada	LINE should not automatically call SKIP_LINE	
AI-00605	4.6	GET_	LINE skips terminators at the end of the line,	
AI-00488	4.6	which is inconsistent with other GET/	line terminators in GET routines causes	
AI-00487	4.6	problems in interactive/	line to be read	/and END_OF_FILE should
AI-00605	4.6	not return TRUE when there is still an empty	line, which is inconsistent with other GET/	
RR-0653	8.2	GET_LINE skips terminators at the end of the	linking	Need to
RR-0696	13.4	declare constants whose value is supplied after	LIST and PAGE should be optional	
RR-0317	2.2.12	Pragmas	list items, etc	
RR-0030	13.6	Augment Ada's looping: over reals,	list non-local objects referred to	
RR-0096A	12.2.3	Require subprogram specification to	literal	
RR-0156	12.3.12	Permit renaming an enumeration literal as a character	literal is allowed	
RR-0166	13.3	A negative literal should be allowed wherever a	literal representations of an abstract data type	
RR-0156	12.3.12	Allow definition of the	literal should be allowed wherever a literal is allowed	
RR-0359	4.6	A negative	literals	
RR-0474	12.2.3	Allow mixed case output for enumeration	literals and operators of a type	
RR-0330	3.1	Need direct visibility to just enumeration	literals, comments, and identifiers	
RR-0302	2.4	Allow national characters in	literals for values of type ADDRESS	
RR-0131	13.4	The language should define	literals of the qualifying type	
AI-00378	12.2.3	/expression, should have visibility of the enumeration	literals should be made directly visible by a	
AI-00390	12.2.3	subtyping declaration	literals should be made directly visible by a	
RR-0239A	12.2.3	subtyping declaration	literals visible	
AI-00262	2.2.8	Renaming an enumeration type should make	literals with fixed point multiplication and division	
RR-0014	4.1	Real	loaded in ROM	
RR-0681	13.7	Need to call subprograms	LOC) should be standardized	
RR-0427	12.1.1	A definition of an Ada Line Of Code (locally-declared task object	
RR-0248	13.1	Do not permit a function to return a	locations for discriminants that are outside	
RR-0146	13.1	record values	locking	
RR-0348	11.1	Support for file/record	log, etc	
RR-0633	6.1	Need predefined functions for real numbers, e.g., trig,	logical operations (e.g., XOR) for integers	
RR-0188	6.1	Provide	logical operations on integer types	
RR-0331	3.1	/need unsigned integers and bit-wise	LONG_CHARACTER (16 bits) and LONG_LONG_CHA	
RR-0061	2.4	Need predefined	Long_Float and Short_Float required types	
RR-0331	3.1	Make	LONG_LONG_CHARACTER (32)	
AI-00211	13.4	Need predefined LONG_CHARACTER (16 bits) and	loop	
RR-0305	2.1	Additional control statement to hop to end of the	loop completion	
RR-0538	9.3	Clarify wording of FOR	loop structure which bans the EXIT statement	
RR-0744	2.2.12	Create new	loop to have non-discrete (fixed-point) parameter	
RR-0317	2.2.12	Allow for	looping: over reals, list items, etc	
AI-00140	12.3.12	Augment Ada's	loops	
RR-0717	2.2.12	Allow -1..10 as a discrete range in	loops	
RR-0743	2.2.12	Allow specification of a step size in FOR	loops	Need to allow
RR-0615	2.2.12	increment of something other than one in for	LOOP/UNTIL control structure as in Pascal	
AI-00216	10.2	Define	lower case, control, etc., independent of/	
RR-0502	2.1	/whether characters are numeric, upper case,	lower cases	The Standard
RR-0297	13.4	should be consistent in its use of upper and	LOW_LEVEL_IO was a bad idea; remove this	
RR-0300	13.2	package from the language	LR grammar to define the syntax of the language	
RR-0252E	11.1	Use an	machine architecture	
AI-00609	11.1	Provide a floating point model that reflects actual	machine characteristics	Floating point machine
RR-0252A	11.1	attributes inadequate to fully characterize	machine characteristics	Ensure support for
RR-0371	13.1.1	IEEE floating point standard; allow full use of	machine code insertions	
RR-0490	2.3	Need more usable and portable	machine code insertions	
RR-0626	6.2	/successful/convenient recovery from exceptions in	machine e.g., because of dope vectors	
		/portable among compilers, even for the same target		

RR-0284	13.1.1	with INLINE macros		Machine-code insertions are unreadable; replace
RR-0489	13.1.1		Allow	machine-code insertions in functions as well as procedures
RR-0691	13.1.1		Allow	machine-code insertions in functions as well as procedures
RR-0411	2.4	Express record representation clauses in a		machine-independent way
RR-0318	2.1	available (with embedded mark-up)	Make a	machine-readable version of the Standard
RR-0642	13.4	Add label variables to support use of finite state		machines
RR-0741	7.3	Need hot performance on vector		machines; add vector types and operands
RR-0284	13.1.1	Machine-code insertions are unreadable; replace with INLINE		macros
RR-0210	13.7	Need more pragmas for software		maintenance to MIL standards
RR-0507	11.2	Provide information/control over row-		major or column-major ordering
RR-0368B	4.3	by the compiler/	Ensure the library can be	manipulated by tools other than those provided
RR-0492	11.1	point type definitions	Decouple	mantissa and exponent information in floating
RR-0564	11.1	Allow implementation freedom to include more		mantissa digits in floating point safe numbers
RR-0024	11.1	Need a way to decompose floating point numbers into		mantissa/exponent
RR-0645	11.1		Need	mantissa/exponent extraction and manipulation
RR-0346	11.1	Need portable way to extract		mantissa/exponent from floating point number
RR-0062	7.1	Ensure memory		mapped devices are treated correctly by compilers
RR-0520	13.1	Language should distinguish "sequence" and		"mapping" arrays
RR-0462	12.3.7	Allow selected component form of type		mark in a formal part even when the selected/
RR-0675	12.3.7	Allow a subprogram identifier to be used as a type		mark in its specification
RR-0579	12.3.7	subprogram named FOO	Allow a type	mark of form P.FOO in the formal part of a
RR-0318	2.1	of the Standard available (with embedded		mark-up)
RR-0104	12.1.1	Prohibit access to a task outside its		Make a machine-readable version
RR-0194	12.1.1	Disallow referencing a task from outside its		master
RR-0496	2.1	Clarify termination of tasks whose		master
RR-0189	11.1	Standard should include a floating-point		masters are library units
RR-0354	13.6	Introduce dimensional		math library interface
RR-0051A	11.1	Provide common		mathematics into the language
RR-0745	13.6	Add facilities for dimensional		mathematics packages
RR-0536	11.1	Provide MIN and		mathematics to the language
RR-0110	6.4	access to data in different types or regions of		MAX numeric operators
RR-0238	6.4	Allow access values to designate read-only		memory
RR-0434	7.1	Need atomic read/write operations on shared volatile		/explicit control over placement of and
RR-0421B	6.3	/address structure is sometimes different from		memory
RR-0349	6.3	should not be treated/		memory address structure; a single type for/
RR-0176	9.1	Interrupt addresses and		memory addresses are conceptually different and
RR-0521	5.2	Document run-time system performance and		memory allocation strategies
RR-0372	13.2	Need more convenient support for use of shared		memory among tasks
RR-0541	4.2	Solve problem where heterogeneous processors view		memory differently
RR-0374	4.2	:=, =, DESTROY operations to support		memory management
RR-0062	7.1	Ada should address		Allow user-defined
RR-0728	8.1	Ensure		memory management requirements in distributed systems
RR-0375	13.7	Need simple Ada run-time system for distributed		memory mapped devices are treated correctly by compilers
RR-0150	13.7	Include formal		memory MIMD architectures
RR-0351	13.7	Provide "chaining" of different programs to reduce		memory protection/security
RR-0581C	13.4	Trusted systems require auto-scrubbing of		memory requirements
RR-0655	5.4	Allow a pragma ELABORATE for a subunit to		memory when done with it
RR-0665A	5.4	Add asynchronous		mention a package name given in the context/
RR-0665C	5.4	Support multicast		message queues
RR-0480	8.1	Support		message transfer
RR-0622	2.1	Need standard means of sending		message-driven intertask communication
AI-00832	2.3	The Standard should use		messages between Ada programs
AI-00216	10.2	Effect of depending on parameter passing		"metatype" in describing generic formal types
RR-0210	13.7	numeric, upper case, lower/		method when calling non-Ada programs
RR-0728	8.1	Need more pragmas for software maintenance to		methods for testing whether characters are
RR-0536	11.1	Need simple Ada run-time system for distributed memory		MIL standards
RR-0285	8.2			MIMD architectures
RR-0359	4.6			MIN and MAX numeric operators
RR-0401	2.2	done efficiently because of accuracy/		Minimize the need for run-time elaboration
RR-0286C	5.2	Run-time system should avoid entering privileged		mixed case output for enumeration literals
RR-0192	5.2	Need ability to change priorities during		Mixed-base fixed-point operations cannot be
RR-0116	5.2	User-modifiable priorities needed for		mode
AI-00003	13.1	Allow data of		mode change and for graceful degradation
RR-0197	13.6	cannot be modified		mode change and graceful degradation
RR-0578	2.2.3	be allowed		mode IN in SEND_CONTROL
RR-0202	4.2	assignment operation		mode IN should mean the designated object
RR-0370D	5.2	Relax parameter		mode parameters of limited private types should
RR-0026	13.4.3	Need to set priorities of tasks during		mode rules for limited types that have an
		Permit function parameters to have		mode shifts
				modes IN OUT and OUT

RR-0471	13.6	Allow specification of parameter	modes in subprogram calls for clarity
RR-0598	13.4.3	Permit function parameters to have	modes OUT and IN OUT
RR-0337	5.2	Provide some form of user-	modifiable priorities
RR-0116	5.2	and graceful degradation	User-
RR-0197	13.6	IN should mean the designated object cannot be	modified
RR-0069	4.3	/subprograms and types to be added to a package without	For access types, parameter mode
RR-0393	12.2.3	Can't get direct visibility of fixed point	modifying the original package
RR-0665A	5.4	Support	mult and div operator by renaming
RR-0323	13.4.2	Generalize slice for	multicast message transfer
RR-0494	13.4.2	Allow slices for any dimension in	multidimensional arrays
RR-0508	13.4.2	Allow slices for any dimension in	multidimensional arrays
RR-0094	2.2	Make the	multidimensional arrays
RR-0482	4.3	generate needed operations	multiple declaration rules more complete and consistent
RR-0052	4.3	give desired operations	Multiple derived types from same package do not
RR-0377	8.2	Ada should allow partitioning of programs for	Multiple derived types from same package do not
RR-0289	6.2	no discriminant is present	multiple processor environments
AI-00262	2.2.8	Real literals with fixed point	multiple views of a record structure even when
RR-0591	2.2.8	Allow fixed-point	multiplication and division
RR-0164	4.6	Provide	multiply/divide with universal real operands
RR-0530	13.3	Insufficient support for	multitasking terminal I/O in TEXT_IO
RR-0012	13.3		mutants of limited types
RR-0241	5.2	Need easier and more efficient support for	Mutation of types is needed for AI applications
RR-0590	5.2	Need clear, efficient, standard support for	mutual exclusion
RR-0533	4.3	packages cannot be done	mutual exclusion
AI-00529	13.1	Resolving the meaning of an attribute	Mutually recursive types from different
RR-0101A	4.5	Allow exceptions to be grouped under a single	name
RR-0526A	4.5	Allow exceptions to be grouped under a single	name
RR-0532	2.2.6	components in different variants to share	name
RR-0477	4.5	Provide a way to get the	name
RR-0476	13.6	type-conversion functions with the same	name and location of a raised exception
RR-0036	4.5	Allow exceptions to be grouped under a single	name as the target type
RR-0178	4.3	Problems with	Allow user-written
RR-0707	2.2.6	Need same-	name by allowing exception subtypes
AI-00582	13.4	Need a standard	name clashes with big program libraries
RR-0145	4.5	Provide a way to get exception	name component identifiers in different variants
RR-0581C	13.4	/ELABORATE for a subunit to mention a package	name for null address
RR-0772	4.5	Need to be able to get exception	name from WHEN OTHERS handlers
RR-0774G	4.5	Provide exception	name given in the context clause of a parent/
RR-0049	13.4	Allow special notation when the same	name in a handler
RR-0407A	4.5	Need exception	name in OTHERS handler
RR-0033A	4.5	Need to find the	name is on both sides of :=
RR-0526C	4.5	Need to determine the	name, line number, and unit name where raised
RR-0085	4.5	Need to get the	name of a raised exception
RR-0403	4.5	Need to be able to get the	name of a raised exception
RR-0219	4.5	Provide a way to get the	name of the current exception
RR-0340	12.3.13	Allow optional simple	name of the current exception
RR-0205	12.3.13	Allow program unit	name of the last raised exception, including an out-of/
RR-0570	13.1	Allow the prefix of a	name on CASE, IF, and SELECT statements
RR-0596	12.3.13	Allow END type_	name on PRIVATE, BEGIN, and EXCEPTION
RR-0673	12.3.13	Allow "END RECORD type_"	name to denote a renaming of an enclosing construct
RR-0407A	4.5	Need exception name, line number, and unit	name to substitute for END RECORD
RR-0765	13.1	Allow "when Package_"	name to substitute for "END RECORD"
RR-0557	4.3	get around the inability to overload subunit	name where raised
RR-0424	13.6	during instantiation	Name.OTHERS => as exception handler
RR-0714	12.3.8	Allow default	names
RR-0469	13.4	Parameter	names
RR-0528	2.1	Change Ada character names to recognized	names
RR-0395	2.2	Include formal parameter	names
RR-0600	2.2	Allow formal parameter	names
RR-0774D	13.1	Allow overloaded	names
RR-0607	13.1	operator symbols	names
RR-0038	4.3	Allow expanded instead of simple	names
RR-0315	2.4	INTEGER_32, to improve/	names
RR-0606	13.5.4	Allow generic subprogram	names
RR-0073	4.3	Allow visibility of	names
RR-0528	2.1	Change Ada character	names
RR-0774H	4.5	Provide more predefined exception	names
AI-00458	4.3	Problem with	names

RR-0050	3.1		Provide multi-	national and multi-byte characters
RR-0330	3.1		Allow	national characters in literals, comments, and identifiers
RR-0367	3.1	string comparison	Need support for	national language character sets, including
RR-0366	13.6		Subtype	natural should not include zero
RR-0156	12.3.12	literal is allowed	A	negative literal should be allowed wherever a
RR-0637	11.1		Ada programs should run as though	negative zero did not exist
RR-0548	13.4		Allow convenient syntax for instantiating a	nested generic unit
AI-00214	2.2.7		Allow accept statements in program units	nested in tasks
RR-0543	2.2.7		Allow accept statements in subprograms	nested inside tasks
RR-0580	2.2.7		Allow accepts within subprograms/packages	nested inside tasks
RR-0763	2.3		Allow	nested scopes to turn off pragma SUPPRESS
RR-0568	2.2		Allow non-	nested variant parts in record types
RR-0774A	4.2		Make it possible to write	NEW in Ada
RR-0538	9.3		Create	new loop structure which bans the EXIT statement
RR-0251	13.6	array reference, and conversions	Invent	new notations to distinguish function call,
RR-0540	4.3		Allow a	new package to build on an existing package
RR-0322	13.1		Do not add any	new reserved words to the language
RR-0255	11.1		Provide a function for returning the value of the	next floating point number
RR-0250	12.1.2		Define clearer	notation for expressing null ranges
RR-0049	13.4		Allow special	notation when the same name is on both sides of :=
RR-0251	13.6	reference, and conversions	Invent new	notations to distinguish function call, array
AI-00479	12.3.10		Initialize access type OUT parameters to	null
RR-0247	13.6		Don't initialize access variables by default to	NULL
RR-0559	13.6		of OUT parameters, initialize OUT access to	NULL
AI-00582	13.4		Need a standard name for	If allow reading
RR-0169	13.4	formal subprogram values	Allow	null address
RR-0250	12.1.2		Define clearer notation for expressing	"null" procedures for actual or default generic
RR-0249	12.1.2		'First and 'last for	null ranges
RR-0234	12.1.2	implementation burden	"Sub-"	null ranges are defined oddly
AI-00681	13.4		Can't declare a constant of a	null ranges are of little value and an
RR-0053	13.4		Allow aggregates for	NULL record type
RR-0255	11.1		returning the value of the next floating point	null records and arrays
RR-0346	11.1		extract mantissa/exponent from floating point	number
RR-0407A	4.5		Need exception name, line	number
RR-0417	6.2		Length clause should force allocation of EXACT	number, and unit name where raised
RR-0361	4.6	format of numbers	Increase the	number of bits
RR-0127	13.4		Allow real	number of options for controlling the output
RR-0718	9.1		Need predictable results in	number output in non-decimal bases
RR-0535	11.1		Provide CEILING and FLOOR	numeric computation, especially regarding optimization
RR-0536	11.1		Provide MIN and MAX	numeric operators
RR-0227	4.4		Allow generic parameterization with static	numeric operators
AI-00285	4.4		Need to be able to access a base	numeric quantities
RR-0715	2.2		Allow user-defined type conversions and attributes for	numeric type in some algorithms
RR-0716	11.1		Unify and add attributes for	numeric types
RR-0712	4.4		Need ability to declare double precision	numeric types
AI-00216	10.2		/methods for testing whether characters are	numeric types within a generic unit
RR-0453	11.1		function or attribute yielding the sign of a	numeric, upper case, lower case, control, etc. /
RR-0583	2.1		Delete	numeric value
RR-0692	2.3		if restrictions implied by the pragmas are not	Provide a special
RR-0287	2.4		Make access types point directly to designated	NUMERIC_ERROR if now subsumed by C_E
RR-0394	13.3		Merge concepts of task and package into concept of an	object
RR-0427	12.1.1		a function to return a locally-declared task	object
RR-0524	6.4		programmer to ensure pass by reference for any	object
RR-0017	6.2		Be able to treat an Ada	Do not permit
RR-0197	13.6		parameter mode IN should mean the designated	object as an array of storage units
RR-0229	13.4		/of a scalar type and the initial value of an	object cannot be modified
RR-0440	4.3		Extend Ada to be truly	object to ensure these values are not used/
RR-0125	4.3		Introduce	object-oriented
RR-0140	4.3		Provide support for	object-oriented inheritance into the language
RR-0223	4.3		Need to add inheritance to support	object-oriented programming
RR-0516	4.3		Provide more support for	object-oriented programming
RR-0662	4.3		Need package classes and inheritance for	object-oriented programming
AI-00142	7.1		SHARED to be applied to components of composite	objects
RR-0119	7.1		reference to elements of shared composite	objects
RR-0258	6.4		Need access values that point to declared	objects
RR-0293	6.4		Allow access values to point to declared	objects
RR-0414	4.1		Ada needs subprogram types and subprogram	objects
RR-0524	6.4		/functions to return references to components of	objects; allow programmer to ensure pass by/

RR-0338	6.4	values and access/	Provide pointers to static	objects and safe conversion between ADDRESS
RR-0464	12.3.5		Should be able to set STORAGE_SIZE for task	objects as well as types
RR-0515	4.2		/to request indivisible update for specific	objects, especially in distributed systems
RR-0421C	6.3		Need to associate interrupts with entries of task	objects, not task types
RR-0648	12.3.5		Need to set STORAGE_SIZE on task	objects, not task types
RR-0703	12.3.5		Need to specify STORAGE_SIZE on task	objects, not task types
RR-0679	13.4		Allow component selection on	objects of a private type
RR-0430A	4.1		Need	objects of a subprogram "type"
RR-0466	4.2		Allow user-defined finalization for	objects of a type to ensure release of resources
RR-0523	4.2		Allow user-defined finalization for	objects of a type to ensure release of resources
RR-0082	2.2.5		Allow declaration of	objects of private types in visible package specification
RR-0030	13.6	Require subprogram specification to list non-local		objects referred to
RR-0298	2.1		Clarify classes of	objects usable as attribute prefixes
RR-0013	2.1		Allow task activation to	occur at a higher priority than task execution
RR-0438	3.1		Allow use of multi-	octet character set
RR-0426C	13.6	causes programmer errors		Omitting index constraint in constant arrays
RR-0076	5.2		Allow selection of entry calls from entry queues and	open alternatives based on priorities
RR-0425	13.1		Need	open ranges in declarations of real subtypes
RR-0193	5.2		inheritance, and prioritized treatment of	open select alternatives /queues, priority
RR-0025	12.3.9		of the equality operator with different	operand types Allow overloading
RR-0591	2.2.8	Allow fixed-point multiply/divide with universal real		operands
RR-0741	7.3	on vector machines; add vector types and		operands
RR-0710	6.3	to asynchronous external events generated by		operating system
RR-0186	13.3	It is difficult to write an entire		operating system in Ada
RR-0201B	4.2	Overload the assignment		operation
RR-0202	4.2	rules for limited types that have an assignment		operation
AI-00329	4.6	Look-ahead		operation for TEXT_IO
RR-0052	4.3	types from same package do not give desired		operations
RR-0089	4.6	Provide facilities for I/O screen		operations
RR-0163	10.4	with appropriate equality and assignment		operations
RR-0358	11.1	Need support for floor, ceiling, truncate, and whole		operations /support for variable-length strings
RR-0461	5.2	Provide standard package of semaphore		operations
RR-0467	12.2.3	Need convenient way to rename a type and get its		operations
RR-0482	4.3	types from same package do not generate needed		operations
RR-0558	13.4	type should be able to hide subset of derived		operations
RR-0636	11.1	Improve Ada's axioms for floating point		operations
RR-0644	9.1	specify time bounds/constraints for certain		operations
RR-0694	12.2.3	Need easy direct visibility to the equality		operations
RR-0766	6.1	Allow bit-wise		operations (AND, SHIFT) on integers, bytes, etc
RR-0529	13.5	properties of types	Allow selection of	operations based on run-time queries about
RR-0401	2.2	of accuracy/	Mixed-base fixed-point	operations cannot be done efficiently because
RR-0633	6.1		Provide logical	operations (e.g., XOR) for integers
RR-0139	6.1		Provide shift and rotate	operations for boolean arrays
RR-0634	6.1		Provide arithmetic shift	operations for integers
RR-0188	6.1	/applications need unsigned integers and bit-wise logical		operations on integer types
RR-0434	7.1	Need atomic read/write		operations on shared volatile memory
RR-0638	13.1	Axioms for built-in		operations should be specified explicitly
RR-0136	6.1	Provide support for bit-field		operations such as shift, rotate
RR-0541	4.2	Allow user-defined :=, =, DESTROY		operations to support memory management
RR-0381	2.2	Records should have composed		operations with respect to components
RR-0208	13.4	/to initiate TEXT_IO, DIRECT_IO, and SEQ_IO		operations without waiting for completion
RR-0504	13.4	Add an exchange		operator
RR-0393	12.2.3	direct visibility of fixed point mult and div		operator by renaming
RR-0652	12.2.3	Declaring a subtype should make the equality		operator directly visible
RR-0008	12.3.9	Allow overloading of the equality		operator for all types
RR-0184	4.2	Need user-defined assignment		operator for limited private type
RR-0102	11.1	Provide explicit remainder		operator for real numbers
RR-0266	13.6			Operator overloading is dangerous
RR-0607	13.1	Allow names of compilation units to be overloadable,		operator symbols
RR-0025	12.3.9	Allow overloading of the equality		operator with different operand types
RR-0535	11.1	Provide CEILING and FLOOR numeric		operators
RR-0536	11.1	Provide MIN and MAX numeric		operators
RR-0555	12.2.3	Need "selective" USE clause to get just		operators and subprograms of a type
RR-0204	2.1	Clarify which fixed point		operators are predefined
RR-0022	12.2.3	Need direct visibility of		operators declared in another package
RR-0057	12.2.3	Need direct visibility to infix		operators in another package
RR-0232	12.2.3	Need to allow direct visibility of		operators in packages
RR-0474	12.2.3	visibility to just enumeration literals and		operators of a type
				Need direct

AI-00480	12.2.3	subtype declaration		Operators should be made directly visible by a
RR-0682	13.5.1		Allow user-defined overloaded	operators such as "?", ":-", etc
RR-0201A	13.5.1		Liberalize overloading of	operators to other character sequences
RR-0572	13.1	integer types	Need predefined	operators with respect to all predefined
RR-0685	2.2		Clarify and loosen 11.6 to allow more	optimization
RR-0718	9.1		in numeric computation, especially regarding	optimization
RR-0739	2.2		Relax 11.6 canonical order rules to allow more	optimization
RR-0387	2.2		Relax 11.6	optimization rules to allow compiler to do more optimizing
RR-0729	9.1		Language should provide way to turn off	optimization to eliminate bugs
RR-0740	2.2	subprograms, allow merging of scopes	For	optimization with respect to inlined
RR-0386	9.1		Need standard way of telling the compiler not to	optimize
AI-00280	2.2		Allow pragma	OPTIMIZE in package specifications
RR-0387	2.2		optimization rules to allow compiler to do more	optimizing
RR-0218	12.2.1		find a good library-unit elaboration	order
RR-0137	2.4		Standardize bit storage/	order conventions
RR-0042	2.3		Clarify the meaning of incorrect	order dependence and its effects
RR-0066	2.3		associated with erroneous execution/incorrect	order dependences
RR-0657	5.2			Order entry queues based on priority
RR-0428	12.2.2			Order of declarations is too restrictive
RR-0767	12.2.1	pragma ELABORATE	Solve the elaboration	order problem without requiring the use of
RR-0739	2.2		Relax 11.6 canonical	order rules to allow more optimization
RR-0507	11.2		over row-major or column-major	ordering
RR-0396	12.2.1		Add library unit elaboration	ordering rules to reduce need for pragma ELABORATE
RR-0586	4.4		evaluate their actual parameters in different	orders
RR-0421D	6.3		The treatment of interrupts as	ordinary, timed, or conditional calls may depend/
RR-0440	4.3		Extend Ada to be truly object-	oriented
RR-0125	4.3		Introduce object-	oriented inheritance into the language
RR-0140	4.3		Provide support for object-	oriented programming
RR-0223	4.3		Need to add inheritance to support object-	oriented programming
RR-0516	4.3		Provide more support for object-	oriented programming
RR-0662	4.3		Need package classes and inheritance for object-	oriented programming
RR-0069	4.3		to be added to a package without modifying the	original package
RR-0479	13.1		to get user-interface information from	OS
RR-0355	2.4		Standardize means of getting the	OS command line arguments
RR-0426D	13.4		Optional index in 'FIRST (and	others) causes problems
RR-0571A	12.2.5	index bounds are determined by/	Allow use of	OTHERS choice with named associations when
RR-0774G	4.5		Provide exception name in	OTHERS handler
RR-0145	4.5		Provide a way to get exception name from WHEN	OTHERS handlers
RR-0605	12.2.5		Rules for	OTHERS in aggregates are confusing
RR-0029	12.2.5	constraint is determined by/	Allow use of	OTHERS with named associations when the index
RR-0026	13.4.3		Permit function parameters to have modes IN OUT and	OUT
RR-0598	13.4.3		Permit function parameters to have modes OUT and IN	OUT
RR-0559	13.6		If allow reading of OUT parameters, initialize	OUT access to NULL
RR-0598	13.4.3		Permit function parameters to have modes	OUT and IN OUT
RR-0026	13.4.3		Permit function parameters to have modes IN	OUT and OUT
RR-0103A	2.2.3		Allow unchecked conversion for IN	OUT and OUT parameters
AI-00478	12.3.10		Allow reading of	OUT formal parameters
RR-0404	4.6		Need convenient way to find	out if a particular file exists
RR-0213	2.4		Need to be able to find	out if an implementation rounds up or down
RR-0264	13.3		Discriminants need to stand	out more
AI-00840	2.2.3		Allow access	OUT parameter as attribute prefix
RR-0002	12.3.10		Allow reading of	OUT parameters
RP-0103A	2.2.3		Allow unchecked conversion for IN OUT and	OUT parameters
RR-0303	12.3.10		Allow reading of	OUT parameters
RR-0539	12.3.10		Allow reading of	OUT parameters
RR-0574	2.2		Inability to eliminate constraint check for	OUT parameters
RR-0559	13.6		If allow reading of	OUT parameters, initialize OUT access to NULL
AI-00479	12.3.10		Initialize access type	OUT parameters to null
RR-0621A	4.5		Need to find	out which exception has been raised
RR-0588	13.4		Provide a form of USE clause that hides	outer homographs
RR-0578	2.2.3	should be allowed		Out-mode parameters of limited private types
RR-0219	4.5		name of the last raised exception, including an	out-of-scope exception
RR-0235	4.6		Need support for interactive terminal input/	/a way to get the
RR-0485	4.6		Provide means to get the line length of an input or	output
AI-00485	4.6		Having independent standard input and	output device
RR-0359	4.6		Allow mixed case	output files is not useful for interactive I/O
RR-0361	4.6		Increase the number of options for controlling the	output for enumeration literals
RR-0127	13.4		Allow real number	output format of numbers
				output in non-decimal bases

RR-0149	4.6		Provide a keyboard input/	output package
RR-0724	2.1	implicit conversion	Need clearer/simpler	overload resolution rules, especially for
RR-0519	13.1		Simplify	overload rules for ambiguous/universal expressions
RR-0557	4.3		bodies helps get around the inability to	overload subunit names /to provide subprogram
RR-0201B	4.2			Overload the assignment operation
RR-0452	13.4	Allow constant functions in static expressions (or		overloadable constants)
RR-0429	12.2.3		Need construct that makes just	overloadable declarations directly visible
RR-0607	13.1	Allow names of compilation units to be		overloadable, operator symbols
RR-0035	13.5.4		Allow generic units to be	overloaded
RR-0606	13.5.4	Allow generic subprogram names to be		overloaded
RR-0412	12.3.9		Allow	overloaded = for all types, not just limited types
RR-0774D	13.1		Allow	overloaded names in the library
RR-0682	13.5.1		Allow user-defined	overloaded operators such as "?", ":-", etc
RR-0041	4.3	ancestor library unit	Allow	overloaded subunits with respect to a common
RR-0266	13.6		Operator	overloading is dangerous
RR-0663	4.2		Allow certain	overloading of := and subscripting
RR-0513	12.3.9	an array type	Allow	overloading of = for any type, e.g., returning
RR-0201A	13.5.1		Liberalize	overloading of operators to other character sequences
RR-0008	12.3.9		Allow	overloading of the equality operator for all types
RR-0025	12.3.9	different operand types	Allow	overloading of the equality operator with
RR-0687	2.2.9		Pragma INLINE should not apply to all	overloads; only closest
RR-0730	13.4		The private part of a package should have its	own context clause
RR-0773	6.2	data transmission	Need to	pack variable-length records into a block for
RR-0022	12.2.3	Need direct visibility of operators declared in another		package
RR-0057	12.2.3	Need direct visibility to infix operators in another		package
RR-0069	4.3	to a package without modifying the original		package /subprograms and types to be added
RR-0149	4.6		Provide a keyboard input/output	package
RR-0162	13.1		Provide a clean interface to a SORT	package
RR-0270	13.4	Allow specification of read-only data from a		package
RR-0540	4.3	Allow a new package to build on an existing		package
RR-0624	12.2.3	Provide selective direct visibility into a		package
RR-0093	13.4	of deferred constants to be given in a		package body
RR-0307	4.3	Allow completion of private declarations to be in the		package body
RR-0774L	13.1	Allow pragma INTERFACE within a		package body
RR-0725	12.4.1		Need rename in	package body for routine in package specification
RR-0426A	12.2.4		The effect of an optional	package body is confusing to users
AI-00442	13.4		Time zone information in	package CALENDAR
RR-0662	4.3	object-oriented programming	Need	package classes and inheritance for
RR-0451	4.3		Changes to	package constants should not cause recompilation
RR-0727	12.2.3		Need selective direct visibility of	package declarations
RR-0482	4.3		Multiple derived types from same	package do not generate needed operations
RR-0052	4.3		Multiple derived types from same	package do not give desired operations
RR-0297	13.4	LOW_LEVEL_IO was a bad idea; remove this		package from the language
RR-0483	12.3.7	as the generic unit (as is allowed for		package instances) /to have the same identifier
RR-0394	13.3	Merge concepts of task and		package into concept of an object
RR-0581C	13.4	/a pragma ELABORATE for a subunit to mention a		package name given in the context clause of a/
RR-0748	5.4		Provide standard	package of asynchronous primitives
RR-0774B	13.6	Tasking defined as a standard		package of functions
RR-0159	4.6		Add standard	package of general file system functions
RR-0461	5.2		Provide standard	package of semaphore operations
RR-0730	13.4		The private part of a	package should have its own context clause
RR-0082	2.2.5	of objects of private types in visible		package specification
RR-0725	12.4.1	Need rename in package body for routine in		package specification
AI-00280	2.2	Allow pragma OPTIMIZE in		package specifications
RR-0581B	2.1	Clarify the effect of applying pragma ELABORATE to a		package that has no body
AI-00291	4.4	Can't define a generic		package that works for all floating point types
RR-0540	4.3		Allow a new	package to build on an existing package
RR-0442	4.3		Extend Ada to allow a	package type hierarchy
RR-0081	4.1		Provide subprogram and	package types
RR-0660	4.2	Need constructors and destructors for		package types
RR-0668	4.3		Need	package types to get, for example, an array of packages
RR-0069	4.3	Allow subprograms and types to be added to a		package without modifying the original package
RR-0765	13.1		Allow "when"	Package_Name.others => as exception handler
RR-0051A	11.1		Provide common mathematics	packages
RR-0051B	10.4		Provide standard string manipulation	packages
RR-0215	2.1	Clarify termination of tasks dependent on library		packages
RR-0232	12.2.3	Need to allow direct visibility of operators in		packages
RR-0385	4.2		Need finalization code for	packages

RR-0478	13.1	for restricting use of resources to trusted	packages	Add language facilities
RR-0484	4.6	functionality as parameters to generic TEXT_IO	packages	Add DEFAULT_xy
RR-0560	4.3	a private type's representation in related	packages	Need to access
RR-0668	4.3	Need package types to get, for example, an array of	packages	
RR-0203	4.2	Allow finalization code for	packages and tasks	
RR-0294	met	applications; make Chapter 14 optional	I/O	
RR-0706	4.4	Allow exceptions and	packages are not suitable for embedded	
RR-0533	4.3	Mutually recursive types from different	packages as generic parameters	
RR-0222	8.1	Need additional predefined	packages cannot be done	
RR-0051C	10.4	Provide	packages for process control/communication	
RR-0005	4.4	Exception declarations in generic	packages for string edit functions	
RR-0684	4.3	Related	packages make code sharing unnecessarily difficult	
RR-0580	2.2.7	Allow accepts within subprograms/	packages need access to a private type's representation	
RR-0296	met	Make predefined I/O	packages nested inside tasks	
RR-0174	4.3	concurrency protection	packages optional if appropriate	
RR-0257	2.1	Ensure that BOOLEAN and BYTE arrays can be tightly	packages to be generic with respect to	
RR-0357	10.1	decimal deltas	packed	
RR-0310	10.4	Need convenient way to	packed decimal, wide-ranging fixed-point,	
RR-0552	13.4	pad-fill to 'LENGTH	pad with blanks in string assignments	
AI-00487	4.6	when there is still an empty line to/	"padded" line input with truncation and	
RR-0696	13.4		PAGE and END_OF_FILE should not return TRUE	
RR-0625	13.6	Change EXIT/WHEN to WHEN/EXIT to	PAGE should be optional	
RR-0665B	8.2	Support allocation of	parallel Ada IF and English	
RR-0514	7.3	Provide support for simple	parallel processes to processors	
RR-0747	13.6	Provide better support for "light-weight"	parallel threads within a program unit	
RR-0376	13.3	Need special treatment of exceptions in distributed/	parallelism (as in Linda)	
AI-00473	2.2.3	actual parameter should be allowed as a default	parallel/multi-processor systems	
RR-0659	4.4	Need to make entry call on a generic formal	parameter	Any form of
RR-0744	2.2.12	Allow for loop to have non-discrete (fixed-point)	parameter	
AI-00840	2.2.3	Allow access OUT	parameter	
RR-0214	13.1	Require that a subprogram	parameter as attribute prefix	
RR-0165	2.3	compile-time errors	parameter be used within the body	
RR-0576	13.4	previous IN parameters	parameter constraint violations to be	
RR-0197	13.6	object cannot be modified	parameter default expressions to make use of	
RR-0202	4.2	have an assignment operation	parameter mode IN should mean the designated	
RR-0471	13.6		parameter mode rules for limited types that	
RR-0469	13.4	should be defined	parameter modes in subprogram calls for clarity	
RR-0395	2.2		Parameter names for language-defined pragmas	
RR-0600	2.2		parameter names in parameter/result-type profile	
RR-0217	13.1		parameter names in parameter/result-type profile	
AI-00832	2.2		parameter of an entry be used within an accept	
RR-0693	2.2	generic code sharing hard	parameter passing method when calling non-Ada programs	
AI-00473	2.2.3		Parameter passing rules for scalars makes	
RR-0239B	2.2.3	A renamed type cannot be used in an actual	parameter should be allowed as a default parameter	
RR-0097	13.4	Allow/require explicit action to get default	parameter type conversion	
RR-0228	4.4		parameter value	
RR-0227	4.4		parameterization with exceptions	
RR-0646	13.2		parameterization with static numeric quantities	
RR-0395	2.2		parameterized with parameters read in handler	
RR-0600	2.2		parameter/result-type profile	
AI-00452	4.4		parameter/result-type profile	
AI-00478	12.3.10		parameters	
RR-0002	12.3.10		parameters	
RR-0103A	2.2.3	Allow unchecked conversion for IN OUT and OUT	parameters	
RR-0283	4.3	Need convenient way to set global compilation	parameters	
RR-0303	12.3.10		parameters	
RR-0430B	4.1		parameters	
RR-0505B	4.4		parameters	
RR-0539	12.3.10		parameters	
RR-0574	2.2	Inability to eliminate constraint check for OUT	parameters	
RR-0576	13.4	default expressions to make use of previous IN	parameters	Allow parameter
RR-0671	4.4		parameters	
RR-0706	4.4		parameters	
RR-0714	12.3.8		parameters	
RR-0774K	4.1		parameters	
RR-0749	12.3.11		parameters	
RR-0422	4.1		parameters and as values in record components	
RR-0611	4.1		parameters and maybe also as values	
			parameters, etc	

RR-0774J	4.4		Allow generic	parameters for any Ada entity, e.g., exceptions
RR-0180	4.1		There is a need for procedures as	parameters for X-Windows, etc
RR-0334	7.2	to process part of an/	Need to specify task	parameters giving a task its work domain, e.g.,
RR-0586	4.4	generic unit may have to evaluate their actual		parameters in different orders /of the same
RR-0559	13.6		If allow reading of OUT	parameters, initialize OUT access to NULL
RR-0578	2.2.3		Out-mode	parameters of limited private types should be allowed
RR-0646	13.2		Allow exceptions to be parameterized with	parameters read in handler
RR-0484	4.6		Add DEFAULT_xy functionality as	parameters to generic TEXT_IO packages
RR-0101B	4.4		Need to pass exceptions as	parameters to generic units and subprograms
RR-0526B	4.4		Need to pass exceptions as	parameters to generic units and subprograms
AI-00451	4.4		Task entries as formal	parameters to generics
RR-0026	13.4.3		Permit function	parameters to have modes IN OUT and OUT
RR-0598	13.4.3		Permit function	parameters to have modes OUT and IN OUT
AI-00479	12.3.10		Initialize access type OUT	parameters to null
RR-0512	4.1		Provide subprograms as	parameters to subprograms
RR-0128	4.1		Provide subprograms as	parameters to subprograms and entries
RR-0641	4.1		Add subprograms as	parameters to the language
RR-0556	2.2.13	the language		Parentheses are used for too many purposes in
RR-0299	13.1		Make everything in the Standard	"part of the standard"
RR-0505B	4.4		Allow	partial match for records as generic parameters
RR-0627	4.4		Allow	partial match to formal type for records
RR-0473	13.5	discriminated records	Allow	"partially" constrained subtypes of
RR-0537	13.6		Separate integer divide and floating divide as in	Pascal
PR-0615	2.2.12		Define LOOP/UNTIL control structure as in	Pascal
RR-0524	6.4		of objects; allow programmer to ensure	pass by reference for any object /no components
RR-0101B	4.4	and subprograms	Need to	pass exceptions as parameters to generic units
RR-0526B	4.4	and subprograms	Need to	pass exceptions as parameters to generic units
RR-0033B	4.4		Need to	pass exceptions to subprograms and generic units
RR-0430B	4.1		Need to	pass subprograms as parameters
AI-00832	2.3		Effect of depending on parameter	passing method when calling non-Ada programs
RR-0693	2.2	sharing hard	Parameter	passing rules for scalars makes generic code
RR-0402	4.3		Need unique hierarchical	pathnames for subunit
RR-0176	9.1		Document run-time system	performance and memory allocation strategies
RR-0084	5.2		conventions for using tasks that permit high-	performance implementations Specify standard
RR-0280	5.1	inefficient; Calendar time unnecessary; timing		performance must be documented /delays are too
RR-0741	7.3	types and operands	Need hot	performance on vector machines; add vector
RR-0705	2.2		For better	performance, remove restrictions on static expressions
RR-0063	5.3		Protect tasks from being aborted while	performing critical functions
RR-0410	5.1		Provide explicit language support for	periodic tasks
RR-0579	12.3.7		Allow a type mark of form	P.FOO in the formal part of a subprogram named FOO
RR-0360	10.4		Add	picture-formatting capabilities to TEXT_IO
RR-0746	13.7		Allow	pictures/graphics as comments in source code
RR-0110	6.4	types or regions/	Provide explicit control over	placement of and access to data in different
RR-0444	13.4		Let the user limit the	places where a given exception can be raised
RR-0447	4.6		to preserve/restore the default file at any	point Need to be able
RR-0256	13.1	is needed	Fixed-	point approach with range and delta is not what
RR-0144	13.3	hardware is not/	Require support for fixed	point arithmetic even if floating point
RR-0357	10.1		Need packed decimal, wide-ranging fixed-	point, decimal deltas
RR-0287	2.4		Make access types	point directly to designated object
RR-0144	13.3		for fixed point arithmetic even if floating	point hardware is not present Require support
RR-0436	2.1		Clarify task synchronization	point inconsistencies
AI-00609	11.1	characterize machine characteristics	Floating	point machine attributes inadequate to fully
RR-0189	11.1		Standard should include a floating-	point math library interface
RR-0731	11.1		Standard as a basis for Ada's floating	point model /the Language Compatible Arithmetic
RR-0191	2.2	of the type definition	Fixed	point model numbers should include the bounds
RR-0566	2.2	of the type definition	Fixed	point model numbers should include the bounds
RR-0720	11.1		Floating-	point model should reflect actual hardware architectures
RR-0252E	11.1		Provide a floating	point model that reflects actual machine architecture
RR-0393	12.2.3		Can't get direct visibility of fixed	point mult and div operator by renaming
AI-00262	2.2.8		Real literals with fixed	point multiplication and division
RR-0591	2.2.8		Allow fixed-	point multiply/divide with universal real operands
RR-0255	11.1		for returning the value of the next floating	point number Provide a function
RR-0346	11.1	way to extract mantissa/exponent from floating		point number Need portable
RR-0024	11.1		Need a way to decompose floating	point numbers into mantissa/exponent
RR-0636	11.1		Improve Ada's axioms for floating	point operations
RR-0401	2.2	because of accuracy/	Mixed-base fixed-	point operations cannot be done efficiently
RR-0204	2.1		Clarify which fixed	point operators are predefined
RR-0744	2.2.12		Allow for loop to have non-discrete (fixed-	point) parameter

RR-0252C	11.1	Ensure programmer can choose appropriate floating	point representation
RR-0225	11.1	Ensure floating	point representation with desired accuracy is used
RR-0564	11.1	to include more mantissa digits in floating	point safe numbers /implementation freedom
RR-0252A	11.1	Ensure support for IEEE floating	point standard; allow full use of machine/
RR-0369	11.1	Provide support for floating	point standard IEEE-754
AI-00521	13.3	Fixed	point subtypes should not inherit SMALL
RR-0258	6.4	Need access values that	point to declared objects
RR-0293	6.4	Allow access values to	point to declared objects
RR-0492	11.1	Decouple mantissa and exponent information in floating	point type definitions
RR-0252D	2.2	range definition Fixed	point type should include the bounds of the
AI-00291	4.4	a generic package that works for all floating	point types Can't define
RR-0664	12.3.1	Need 'IMAGE and 'VALUE attributes for floating-	point types
RR-0733	13.5	Need fixed-	point types not centered on zero
RR-0672	13.4	Need anonymous	pointer types
RR-0726	6.4	Need non-contiguous arrays, static	pointers
RR-0338	6.4	between ADDRESS values and access/ Provide	pointers to static objects and safe conversion
RR-0441	4.1	Extend Ada to allow for	polymorphism
RR-0525	4.3	Extend Ada to allow for	polymorphism and inheritance
RR-0750	4.3	Add support for inheritance and	polymorphism to the language
RR-0253	13.1	DIGITS and DELTA approach leads to inefficiency, non-	portability
RR-0315	2.4	size, e.g., INTEGER_32, to improve	portability /names that indicate representation
RR-0365	2.4	variations in implementations to increase	portability Reduce allowed
RR-0432	2.4	Severely limit implementation options to improve	portability
RR-0709	2.4	Need more	portability in getting command line inputs
RR-0613	13.4.1	User-defined attributes solve	portability problems with/
RR-0124	5.2	code dependent on task scheduling algorithms is	portable Ensure that
RR-0626	6.2	/produced by SEQUENTIAL_IO and DIRECT_IO are not	portable among compilers, even for the same/
RR-0698	4.3	Need ability to separate	portable and non-portable code into separate units
RR-0371	13.1.1	Need more usable and	portable machine code insertions
RR-0043	13.1.1	Make it easier and more	portable to use assembler with Ada
RR-0346	11.1	floating point number	portable way to extract mantissa/exponent from
RR-0581	12.2.1	and unhelpful	position of pragma ELABORATE are error-prone
RR-0198	13.4	Rules specifying the	positional aggregate for single-component aggregate
RR-0065	4.3	Allow	possibilities, allow rep clauses and various
RR-0236	2.4	pragmas to be separated from/ To improve reuse	possible /implementation-dependent behavior,
RR-0244B	2.3	or at least, ensure it is documented whenever	possible
RR-0774A	4.2	Flag run-time errors at compile-time when	possible to write NEW in Ada
AI-00460	13.1	Make it	powers for exponentiation
AI-00421	12.2.1	Allow non-integral	pragma ELABORATE
RR-0095	13.4	Eliminate	pragma ELABORATE
RR-0396	12.2.1	Allow applicable units to be named in USE clauses and	pragma ELABORATE Add library unit
RR-0767	12.2.1	elaboration ordering rules to reduce need for	pragma ELABORATE Solve the elaboration
RR-0581	12.2.1	order problem without requiring the use of	pragma ELABORATE are error-prone and unhelpful
RR-0581C	13.4	Rules specifying the position of	pragma ELABORATE for a subunit to mention a
RR-0546	12.2.1	package name given in the context/ Allow a	pragma ELABORATE is used when it is needed
RR-0581A	12.2.1	It is too difficult to ensure that	pragma ELABORATE; pragma NOT_ELABORATE might
RR-0004	12.2.1	Eliminate need for	Pragma ELABORATE should be transitive
RR-0233	12.2.1		Pragma ELABORATE should be transitive
RR-0581B	2.1	Clarify the effect of applying	pragma ELABORATE to a package that has no body
RR-0398	2.2.9	Need clearer/more selective rules for	pragma INLINE applicability
RR-0687	2.2.9	overloads; only closest	Pragma INLINE should not apply to all
RR-0527	4.1	Standardize information/conventions used for	pragma INTERFACE
RR-0774L	13.1	Allow	pragma INTERFACE within a package body
RR-0581A	12.2.1	Eliminate need for pragma ELABORATE;	pragma NOT_ELABORATE might help
AI-00280	2.2	Allow	pragma OPTIMIZE in package specifications
RR-0678	7.1	between programs; need VOLATILE	Pragma SHARED is not sufficient for data shared
AI-00142	7.1	composite objects	pragma SHARED to be applied to components of
RR-0763	2.3	Allow nested scopes to turn off	pragma SUPPRESS
RR-0585	4.4	generic instantiation	pragma to specify code-generation strategy for
RR-0397	13.6	Need	PRAGMA with something capturing meaning better
RR-0211	2.3	Replace keyword	pragmas
RR-0754	2.3	Require compilers to report unrecognized or incorrect	pragmas
RR-0756	2.3	Require warnings for unrecognized	pragmas are ignored
RR-0692	2.3	Require warnings when	pragmas are not obeyed No cause unsuccessful
AI-00850	2.3	compilation if restrictions implied by the	pragma's assumptions are not met
RR-0210	13.7	Rejecting a unit when a	pragmas for software maintenance to MIL standards
RR-0696	13.4	Need more	Pragmas LIST and PAGE should be optional
RR-0469	13.4	Parameter names for language-defined	pragmas should be defined

RR-0065	4.3	/possibilities, allow rep clauses and various	pragmas to be separated from the compilation/
RR-0692	2.3	Allow implementation-defined	pragmas to cause unsuccessful compilation if restrictions/
RR-0276	5.1	Need user specified accuracy and	precision control over timing
RR-0045	2.4	Allow/require extended	precision for intermediate integer results
RR-0635	13.4	Provide basic support for extended	precision integer arithmetic
RR-0712	4.4	Need ability to declare double	precision numeric types within a generic unit
RR-0204	2.1	Clarify which fixed point operators are	predefined
RR-0392	13.5	Need "semi-limited" type with predefined := but no	predefined =
RR-0774H	4.5	Provide more	predefined exception names with finer granularity
RR-0399	13.1	Break up overly broad	predefined exceptions, e.g., CONSTRAINT_ERROR
RR-0416	4.5	Granularity of	predefined exceptions is too coarse
RR-0680	13.1	integer type for exponent	Predefined exponentiation should take any
RR-0348	11.1	trig, log, etc	predefined functions for real numbers, e.g.,
RR-0572	13.1	Need predefined operators with respect to all	predefined integer types
RR-0296	met	Make	predefined I/O packages optional if appropriate
RR-0331	3.1	LONG_LONG_CHARACTER (32)	predefined LONG_CHARACTER (16 bits) and
RR-0572	13.1	predefined integer types	predefined operators with respect to all
RR-0222	8.1	Need additional	predefined packages for process control/communication
RR-0433	6.1	There is a need for	predefined unsigned integer types
RR-0718	9.1	especially regarding optimization	predictable results in numeric computation,
AI-00840	2.2.3	Allow access OUT parameter as attribute	prefix
RR-0570	13.1	enclosing construct	prefix of a name to denote a renaming of an
RR-0298	2.1	Clarify classes of objects usable as attribute	prefixes
RR-0497	13.7	used as generic actual can yield a surprising/	Presence of default discriminants for types
RR-0748	5.4	Provide standard package of asynchronous	primitives
RR-0076	5.2	entry queues and open alternatives based on	priorities
RR-0087	6.3	Allow software priorities to match/exceed hardware	priorities
RR-0337	5.2	Provide some form of user-modifiable	priorities
RR-0654	5.2	Need non-static	priorities
RR-0192	5.2	Need ability to change	priorities during mode change and for graceful degradation
RR-0116	5.2	User-modifiable	priorities needed for mode change and graceful degradation
RR-0370D	5.2	Need to set	priorities of tasks during mode shifts
RR-0000	5.2	/of functions may change during program execution, so	priorities should be changeable
RR-0015	5.2	Allow task	priorities to control all queuing/select decisions
RR-0087	6.3	Allow software	priorities to match/exceed hardware priorities
RR-0347	5.2	priority to/	priorities under program control; allow task
RR-0415	5.2	selective wait	prioritized entry-queues, and prioritized
RR-0072	5.2	needed for real-time applications	Prioritized queues and priority inheritance are
RR-0415	5.2	inheritance, prioritized entry-queues, and	prioritized selective wait
RR-0193	5.2	Allow priority queues, priority inheritance, and	Allow priority
RR-0657	5.2	Order entry queues based on	prioritized treatment of open select/
RR-0193	5.2	of open select/	priority
RR-0072	5.2	Allow priority queues,	priority inheritance, and prioritized treatment
RR-0021	5.2	Prioritized queues and	priority inheritance are needed for real-time applications
RR-0415	5.2	Need	priority inheritance for server tasks
RR-0151	6.3	and prioritized selective wait	priority inheritance, prioritized entry-queues,
RR-0686	6.3	is ill-conceived	priority interrupts
RR-0075	5.2	Queue entries by task	Priority of interrupts higher than normal tasks
RR-0193	5.2	prioritized treatment of open select/	priority or FIFO based on application
RR-0013	2.1	Allow task activation to occur at a higher	priority queues, priority inheritance, and
RR-0347	5.2	/priorities under program control; allow task	priority than task execution
RR-0098	13.4	typing for types other than access or	priority to increase as a function of lack of/
RR-0670	13.6	and /=, do not distinguish private from limited	private
RR-0205	12.3.13	Allow program unit name on	Generalize incomplete
RR-0307	4.3	Allow completion of	Decouple =
RR-0670	13.6	Decouple = and /=, do not distinguish	PRIVATE, BEGIN, and EXCEPTION
RR-0153	13.1	and implementation	private declarations to be in the package body
RR-0730	13.4	context clause	private from limited private
RR-0628	2.2.11	The	Private part foils separation of specification
RR-0487	2.2.11	the task	private part of a package should have its own
AI-00327	2.2.5	Instantiating with an incomplete	private task entries
RR-0184	4.2	Need user-defined assignment operator for limited	private task entries for exclusive use within
RR-0577	2.2	having a component of an incompletely declared	private type
RR-0679	13.4	Allow component selection on objects of a	private type
RR-0542	2.2.5	One way or another allow usage of	private type
AI-00540	12.4.2	Completing a	private type before its completion declaration
RR-0096C	12.4.2	Allow the full declaration of a	private type declaration with a subtype declaration
RR-0010	2.2	Allow the full declaration of a	private type to be provided by a renaming declaration
			private type with discriminants to be a derived type

RR-0313	13.4	Allow deferred constants of arbitrary (i.e., non-	private) types	
RR-0423	2.2	restriction on full declarations of	private types	Remove discriminant
RR-0449	13.1	Do not allow unchecked conversion of	private type:	
RR-0509	13.4.1	Allow user-defined attributes for user-defined or	private types	
AI-00404	2.2	Use of incomplete	private types in generic formal part	
RR-0273	13.6	There are problems with	private types in the language	
RR-0082	2.2.5	Allow declaration of objects of	private types in visible package specification	
RR-0684	4.3	Related packages need access to a	private type's representation	
RR-0560	4.3	Need to access a	private type's representation in related packages	
RR-0578	2.2.3	Out-mode parameters of limited	private types should be allowed	
RR-0690	12.4.2	Allow incomplete and	private types to be completed by subtype declaration	
RR-0599	4.3	Certain changes to derived/	private types will help inheritance	
RR-0286C	5.2	Run-time system should avoid entering	privileged mode	
RR-0597	4.6	Need functional version of GET_LINE instead of	procedural	
RR-0207	4.6	Add TEXT_IO support with Exists function and Append	procedure	
RR-0629	4.1	subprogram calls	procedure and function types for use in	
RR-0096B	12.4.1	Need	procedure body to be provided by a renaming declaration	
RR-0286D	6.3	Allow a	procedure model, not a task model	
AI-00605	4.6	Interrupts should be handled with a	procedures	/skips terminators at the end of
RR-0316	6.3	the line, which is inconsistent with other GET	procedures	
RR-0489	13.1.1	Improve interrupt handling, e.g., with interrupt	procedures	
RR-0691	13.1.1	Allow machine-code insertions in functions as well as	procedures	
RR-0180	4.1	Allow machine-code insertions in functions as well as	procedures	
RR-0169	13.4	subprogram values	procedures as parameters for X-Windows, etc	
RR-0019	4.2	Allow "null"	procedures for actual or default generic formal	
RR-0665B	8.2	Allow types to specify finalization	procedures for safely controlling use of/	
RR-0071	13.2	Support allocation of parallel	processes to processors	
RR-0077	13.4	Improve support for heterogeneous distributed	processing	
RR-0308	11.1	Provide stream I/O for digital signal	processing	
RR-0561	13.5.2	Add libraries for array	processing	
RR-0421A	6.3	Allow case statement to operate on strings for string	processing	
RR-0306	5.1	Need to delay in	processing an interrupt	
RR-0738	7.3	Need to be able to start	processing at a particular time of day	
RR-0377	8.2	Add facilities to support vector	processing hardware	
RR-0376	13.3	allow partitioning of programs for multiple	processor environments	Ada should
RR-0182	8.1	of exceptions in distributed/parallel/multi-	processor systems	Need special treatment
RR-0665B	8.2	for parts of a program running on different	processors	Define visibility limits
RR-0372	13.2	Support allocation of parallel processes to	processors	
RR-0626	6.2	Solve problem where heterogeneous	processors view memory differently	
RR-0326	13.2	portable among compilers, even for the/	produced by SEQUENTIAL_IO and DIRECT_IO are not	
RR-0395	2.2	Files	production style	
RR-0600	2.2	Use a different syntax	profile	
RR-0229	13.4	Include formal parameter names in parameter/result-type	profile	
RR-0275	2.2	Allow formal parameter names in parameter/result-type	programmers	/and the initial value of an object
RR-0581	12.2.1	to ensure these values are not used directly by	prone and counter-intuitive aspects of RENAMES	
RR-0529	13.5	Error-	prone and unhelpful	Rules specifying
AI-00274	13.1	the position of pragma ELABORATE are error-	properties of types	Allow selection
RR-0063	5.3	of operations based on run-time queries about	Proposed extension of the USE	
RR-0174	4.3	clause — record component visibility	Protect tasks from being aborted while	
RR-0375	13.7	performing critical functions	protection	Allow packages
RR-0295	4.6	to be generic with respect to concurrency	protection/security	
AI-00873	2.3	Include formal memory	PUT)	Create TEXT_IO.PUT_LINE
RR-0131	13.4	for types other than string (make like	qualification of undefined scalar values	
RR-0131	13.4	Type conversion/	qualified expression, should have visibility of	
RR-0314	13.7	the enumeration literals of the/	qualifying type	/expression, should have
RR-0529	13.5	visibility of the enumeration literals of the	quality error diagnostics in the standard	
RR-0328	9.3	Define minimum-	queries about properties of types	
RR-0075	5.2	Allow selection of operations based on run-time	questionable uses of the language	
RR-0655	5.4	Require compilers to report	Queue entries by task priority or FIFO based on application	
RR-0076	5.2	Add asynchronous message	queues	
RR-0415	5.2	Allow selection of entry calls from entry	queues and open alternatives based on/	
RR-0072	5.2	Allow priority inheritance, prioritized entry-	queues, and prioritized selective writ	
RR-0657	5.2	real-time applications	queues and priority inheritance are needed for	
RR-0193	5.2	Prioritized	queues based on priority	
RR-0015	5.2	Order entry	queues, priority inheritance, and prioritized	
RR-0651	5.3	Allow task priorities to control all	queuing/select decisions	
RR-0200	12.3.4	Allow one task to	raise an exception in another task	
RR-0135	13.4	Allow optional when_clause on	RAISE and RETURN statements	
		Catenation should not	raise CONSTRAINT_ERROR for intermediate results	

RR-0751	12.3.4	Add WHEN/	RAISE construct to the language
RR-0362	12.3.4	Allow optional when_clause on the	raise statement
RR-0132	12.3.4	Allow optional WHEN <condition> on	RAISE statement for consistency with EXIT statement
RR-0141	12.3.4	Allow WHEN <condition> on	RAISE statements
RR-0407A	4.5	Need exception name, line number, and unit name where	raised
RR-0444	13.4	limit the places where a given exception can be	raised
RR-0582	4.5	info about state when an exception is	raised
RR-0621A	4.5	Need to find out which exception has been	raised
RR-0468	4.4	No generic way to handle exceptions	raised by generic formal subprograms
RR-0033A	4.5	Need to find the name of a	raised exception
RR-0477	4.5	Provide a way to get the name and location of a	raised exception
RR-0526C	4.5	Need to determine the name of a	raised exception
RR-0219	4.5	Provide a way to get the name of the last	raised exception, including an out-of-scope/
RR-0209	2.3	Require the compiler to report certain-to-be-	raised exceptions
AI-00450	5.3	Should allow	raising of an exception in another task
AI-00519	2.2	Default SMALL should be a power of two times the	range
RR-0256	13.1	Fixed-point approach with	range and delta is not what is needed
RR-0623	12.3.3	Define	RANGE attribute for discrete ranges
RR-0155	12.3.3	Define	RANGE attribute for scalar types
RR-0304	12.3.3	Define	RANGE attribute for scalar types
AI-00584	13.4	Restrict argument of	RANGE attribute in Ada 9x
RR-0252D	2.2	Fixed point type should include the bounds of the	range definition
AI-00140	12.3.12	Allow -1..10 as a discrete	range in loops
RR-0229	13.4	an object to ensure these/	range of a scalar type and the initial value of
RR-0571B	2.1	/when the choice in an aggregate is outside the	range of the applicable index constraint
RR-0250	12.1.2	Define clearer notation for expressing null	ranges
RR-0623	12.3.3	Define RANGE attribute for discrete	ranges
RR-0046	13.5.3	Allow testing in discontinuous	ranges and create true sets
RR-0249	12.1.2	'First and 'last for null	ranges are defined oddly
RR-0234	12.1.2	implementation burden	ranges are of little value and an
RR-0425	13.1	Need open	ranges in declarations of real subtypes
RR-0357	10.1	Need packed decimal, wide-	-ranging fixed-point, decimal deltas
RR-0037	5.2	(i.e., delays) to execute using simulated time	rather than a real-time clock
RR-0318	2.1	(with embedded mark-up) Make a machine-	readable version of the Standard available
RR-0320	13.5	Generalize case statement for other types, including	REAL
RR-0252B	11.1	whether rounding or truncation is used in	real calculations
AI-00262	2.2.8	and division	Real literals with fixed point multiplication
RR-0127	13.4	Allow	real number output in non-decimal bases
RR-0102	11.1	Provide explicit remainder operator for	real numbers
RR-0348	11.1	Need predefined functions for	real numbers, e.g., trig, log, etc
RR-0591	2.2.8	Allow fixed-point multiply/divide with universal	real operands
RR-0425	13.1	Need open ranges in declarations of	real subtypes
RR-0454	11.1	Need Entire function or attribute for	real types
RR-0363	12.3.1	Allow 'VALUE and 'IMAGE to apply to	real types as well as discrete types
RR-0317	2.2.12	Augment Ada's looping: over	reals, list items, etc
RR-0759	13.3	control engineering	real-time and verification facilities for
RR-0072	5.2	Prioritized queues and priority inheritance are needed for	real-time applications
RR-0037	5.2	to execute using simulated time rather than a	real-time clock
RR-0493	4.2	should be able to ensure that storage will be	reclaimed
RR-0451	4.3	Changes to package constants should not cause	recompilation
RR-0368A	4.3	Ensure unnecessary	recompilation is avoided
RR-0142	4.3	Reduce cases where	recompilation of subunits is needed
RR-0688	4.3	Unnecessary	recompilation required when redeclaring a
RR-0723	8.2	Need support for	reconfiguration in emergency cases
RR-0370A	8.2	Can't recover space declared in library units when	reconfiguring a system
RR-0596	12.3.13	Allow END type_name to substitute for END	RECORD
RR-0673	12.3.13	Allow "END RECORD type_name" to substitute for "END"	RECORD)
RR-0341	2.2	Allow discriminant value in	record aggregate to be non-static
RR-0573	12.3.11	component initialization and as components of	record aggregates
RR-0531	4.3	be usefully supported with current variant	record approach
AI-00539	2.2.4	Allow use of array/	record attributes in representation clauses
AI-00429	13.4.4	Allow array type definition for	record component
RR-0573	12.3.11	Slide indices of array aggregates for	record component initialization and as/
RR-0086	13.4	Need to initialize a	record component to the address of the record itself
AI-00274	13.1	Proposed extension of the USE clause —	record component visibility
RR-0321	13.4	Permit anonymous array and record declarations for	record components
RR-0443	13.4.4	Need for anonymous array types as	record components
RR-0749	12.3.11	serving as actual parameters and as values in	record components
			Index sliding for slices

RR-0532	2.2.6	Allow same-type	record components in different variants to share name
RR-0321	13.4	Permit anonymous array and	record declarations for record components
RR-0212	13.6	Allow assignment to	record discriminant like other components
RR-0522	2.2	Allow non-discrete	record discriminants
RR-0593	4.6	Mandate implementation of variant	record I/O in DIRECT_IO/SEQUENTIAL_IO
RR-0086	13.4	a record component to the address of the	record itself
RR-0146	13.1	Support for file/	record locking
RR-0411	2.4	Express	record representation clauses in a
RR-0290	13.5	The syntax used in	record representation clauses is hard to read
RR-0289	6.2	Need multiple views of a	record structure even when no discriminant is present
AI-00681	13.4	Can't declare a constant of a NULL	record type
AI-00345	4.6		Record type with variant having no discriminants
RR-0673	12.3.13	Allow "END"	RECORD type_name to substitute for "END RECORD"
RR-0505A	4.3	Provide extendable	record types
RR-0568	2.2	Allow non-nested variant parts in	record types
RR-0722	4.4	Need generic formal	record types
AI-00452	4.4	Allow	record types as generic formal parameters
RR-0248	13.1	locations for discriminants that are outside	record values
RR-0473	13.5	constrained subtypes of discriminated	records
RR-0627	4.4	Allow partial match to formal type for	records
RR-0649	2.2.2	Allow default initialization for all types (not just	records)
RR-0053	13.4	Allow aggregates for null	records and arrays
RR-0505B	4.4	Allow partial match for	records as generic parameters
RR-0773	6.2	Need to pack variable-length	records into a block for data transmission
RR-0336	13.4.4	Allow array type definitions in	records; nice for array-of-array case
RR-0381	2.2	respect to components	Records should have composed operations with
RR-0370A	8.2	reconfiguring a system	recover space declared in library units when
RR-0370E	8.2	tasks are created by an allocator	recover space for task control blocks when
RR-0111	8.1	Provide explicit support for fault tolerance and	recovery
RR-0118	4.2	storage reserve for STORAGE_ERROR	recovery
RR-0490	2.3	Need successful/convenient	recovery from exceptions in machine code insertions
RR-0269	13.6	Make subprograms not	recursive by default
RR-0608	13.3	Allow	recursive generic instantiations
RR-0533	4.3	be done	recursive types from different packages cannot
RR-0688	4.3	Unnecessary recompilation required when	redeclaring a subprogram body
RR-0424	13.6	Allow names exported from an instance to be	redefined during instantiation
RR-0134	13.6	Require	re-evaluation of entry count on abandoned entries
RR-0251	13.6	notations to distinguish function call, array	reference, and conversions
RR-0544	4.2	Need indivisible update on	reference counts
RR-0524	6.4	of objects; allow programmer to ensure pass by	reference for any object
RR-0119	7.1	Need synchronized	reference to elements of shared composite objects
RR-0206	2.1	Paragraph numbers should be included in the cross	references
RR-0309	2.1	Ensure all cross	references are complete and correct
RR-0524	6.4	programmer to ensure/	references to components of objects; allow
RR-0194	12.1.1	Disallow	referencing a task from outside its master
RR-0030	13.6	specification to list non-local objects	referred to
RR-0720	11.1	Floating-point model should	Require subprogram
RR-0252E	11.1	Provide a floating point model that	reflect actual hardware architectures
RR-0718	9.1	results in numeric computation, especially	reflects actual machine architecture
RR-0110	6.4	of and access to data in different types or	regarding optimization
RR-0510	2.2.10		regions of memory
RR-0122	2.2	Permit an implementation to	Need predictable
AI-00850	2.3	are not met	Re-indexing arrays via type conversions
RR-0020	5.2	during program execution, so priorities should/	reject some integer types as array indexes
RR-0466	4.2	finalization for objects of a type to ensure	Rejecting a unit when a pragma's assumptions
RR-0523	4.2	finalization for objects of a type to ensure	Relative importance of functions may change
RR-0676	4.2	Add finalization to ensure	release of resources
AI-00570	12.1.1	type instances	release of resources
RR-0737	5.2	alternatives in a select statement	Releasing heap storage associated with task
RR-0102	11.1	Allow	reliable user control over selection of
RR-0467	12.2.3	Provide explicit	remainder operator for real numbers
RR-0382	4.6	Need convenient way to	rename a type and get its operations
RR-0231	12.4.1	Need to be able to	rename and append to a file in standard Ada
RR-0725	12.4.1	Allow a	rename definition of a subprogram body
RR-0774M	13.1	Need	rename in package body for routine in package spec
RR-0239B	2.2.3	Allow a subprogram to be	renamed in a body
RR-0275	2.2	parameter type conversion	renamed type cannot be used in an actual
RR-0601	2.2	Error-prone and counter-intuitive aspects of	RENAMES
		Allow library-level declarations to be defined by	RENAMES

RR-0667	12.4.1	Allow a subprogram body to be given by	RENAMES
RR-0764	12.4.1	Allow subprogram bodies to be defined by	RENAMES
RR-0610	2.2	Why not allow	RENAMES for types and subtypes?
RR-0550	12.4.1	Allow subprogram bodies to be defined by	RENAMES or generic instantiation
RR-0393	12.2.3	of fixed point mult and div operator by	renaming Can't get direct visibility
RR-0096A	12.2.3	Permit	renaming an enumeration literal as a character literal
RR-0239A	12.2.3	literals visible	Renaming an enumeration type should make
RR-0096B	12.4.1	Allow a procedure body to be provided by a	renaming declaration
RR-0096C	12.4.2	of a private type to be provided by a	renaming declaration /the full declaration
RR-0557	4.3	bodies helps get around the/	renaming declarations to provide subprogram
RR-0570	13.1	Allow the prefix of a name to denote a	renaming of an enclosing construct
RR-0055	12.4.1	Allow a subprogram body to be defined by	renaming or generic instantiation
RR-0470	12.4.1	subprogram body	renaming or generic instantiation to define a
RR-0157	12.4.1		renaming when defining a subprogram body
RR-0185	5.2		rendezvous is slow; semaphores would be better
RR-0173	13.3	set of tasks	rendezvous with a higher-level entity, i.e., a
RR-0065	4.3	from the/	rep clauses and various pragmas to be separated
RR-0171	4.3	To improve reuse possibilities, allow	rep clauses) to be separate from other code
AI-00216	10.2	Allow target-dependent code (including	representation /are numeric, upper case, lower
RR-0252C	11.1	case, control, etc., independent of character	representation Ensure programmer
RR-0684	4.3	can choose appropriate floating point	representation
RR-0048	2.2.4	Related packages need access to a private type's	representation attributes of composite types
RR-0288	13.5	Extend static expressions to include	representation clause information with declarations
AI-00539	2.2.4	Integrate	representation clauses
RR-0418	2.2	Allow use of array/record attributes in	Representation clauses for array types need to
RR-0411	2.4	be added	representation clauses in a machine-independent way
RR-0565	2.2	Express record	representation clauses inappropriate
RR-0290	13.5	'SMALL is unsuitably defined; need for	representation clauses is hard to read
RR-0007	2.4	The syntax used in record	representation for enumeration types should be specified
RR-0465	2.2.14	Default	representation from an enumeration value and
RR-0560	4.3	Need a way to get the	representation in related packages
RR-0315	2.4	Need to access a private type's	representation size, e.g., INTEGER_32, to improve/
RR-0187	2.4	Allow integer type names that indicate	representation specifications
RR-0225	11.1	Need to allow unsigned enumeration	representation with desired accuracy is used
RR-0166	13.3	Ensure floating point	representations of an abstract data type
RR-0059	2.2.14	Allow definition of the literal	representation's underlying value
RR-0515	4.2	Need an attribute for returning a	request indivisible update for specific
RR-0150	13.7	objects, especially in/	requirements Provide "chaining"
RR-0401	2.2	Need ability to	requirements Mixed-base fixed-point operations
RR-0374	4.2	of different programs to reduce memory	requirements in distributed systems
RR-0322	13.1	cannot be done efficiently because of accuracy	reserved words to the language
AI-00223	5.1	Ada should address memory management	resolution for the function CLOCK
RR-0724	2.1	Do not add any new	resolution rules, especially for implicit conversion
AI-00529	13.1	Require adequate	Resolving the meaning of an attribute name
RR-0466	4.2	Need clearer/simpler overload	resources Allow user-defined finalization
RR-0523	4.2	for objects of a type to ensure release of	resources Allow user-defined finalization
RR-0676	4.2	for objects of a type to ensure release of	resources
RR-0478	13.1	Add finalization to ensure release of	resources to trusted packages
RR-0370B	8.2	Add language facilities for restricting use of	restart library level tasks
AI-00584	13.4	Can't	Restrict argument of RANGE attribute in Ada 9x
RR-0478	13.1	Add language facilities for	restricting use of resources to trusted packages
RR-0423	2.2	Remove discriminant	restriction on full declarations of private types
RR-0427	12.1.1	Do not permit a function to	return a locally-declared task object
RR-0352	5.1	Require Calendar.Clock to	return consistently accurate local system time
RR-0524	6.4	Allow functions to	return references to components of objects;
RR-0620	13.6	Ban	RETURN statement except inside functions
RR-0200	12.3.4	Allow optional when clause on RAISE and	RETURN statements
RR-0614	12.3.4	Allow WHEN condition	RETURN to make selection of returned value clearer
AI-00487	4.6	to be/	return TRUE when there is still an empty line
RR-0614	12.3.4	END_OF_PAGE and END_OF_FILE should not	returned value clearer
RR-0059	2.2.14	Allow WHEN condition RETURN to make selection of	returning a representation's underlying value
RR-0513	12.3.9	Need an attribute for	returning an array type
RR-0255	11.1	Allow overloading of = for any type, e.g.,	returning the value of the next floating point number
RR-0383	4.4	Provide a function for	reusable generic units
RR-0065	4.3	Need generic exceptions for truly	reuse possibilities, allow rep clauses and
RR-0066	2.3	various pragmas to be separated/	risks associated with erroneous
RR-0014	4.1	execution/incorrect order dependences	ROM
RR-0136	6.1	Reduce	rotate
		Need to call subprograms loaded in	
		Provide support for bit-field operations such as shift,	

RR-0139	6.1		Provide shift and	rotate operations for boolean arrays
RR-0252B	11.1		Programmer needs to know/control whether	rounding or truncation is used in real/
AI-00526	2.4			Rounding up or down
RR-0409	2.4		Define in the language how 3.5	rounds to integer
RR-0213	2.4		Need to be able to find out if an implementation	rounds up or down
RR-0725	12.4.1		Need rename in package body for	routine in package specification
RR-0669	4.2		Allow user-written :=	routines
AI-00488	4.6		Skipping of leading line terminators in GET	routines causes problems in interactive I/O
RR-0475	4.2		Need automatically-invoked user-defined	routines to reclaim storage
RR-0507	11.2		Provide information/control over	row-major or column-major ordering
RR-0637	11.1		Ada programs should	run as though negative zero did not exist
RR-0243	8.2		Allow/require elaboration prior to	run time
RR-0450	6.4		of buffers whose type is determined at	run time
RR-0246	8.2		/that constant declarations are not elaborated at	Need efficient manipulation
RR-0735	6.3		Need ability to change interrupt bindings at	run time when initialized with static/
RR-0285	8.2		Minimize the need for	run-time
RR-0497	13.7		used as generic actual can yield a surprising	run-time elaboration
RR-0242	2.3		Require compilation warnings for potential	run-time error
RR-0244B	2.3		Flag	/default discriminants for types
RR-0529	13.5		Allow selection of operations based on	run-time errors
RR-0074	5.2		Define a standard	run-time errors at compile-time when possible
RR-0286B	5.2		access to interrupts that are also used by the	run-time queries about properties of types
RR-0421D	6.3		calls may depend inappropriately on the	run-time support environment interface
RR-0279	2.2	include code for/	If tasks are not used, the	run-time system
RR-0175	5.2		Define interface between compiler- and target-specific	run-time system
RR-0728	8.1		Need simple Ada	run-time system
RR-0176	9.1	allocation strategies	Document	run-time system and compiled code should not
RR-0286C	5.2	privileged mode		run-time system aspects
RR-0338	6.4		Provide pointers to static objects and	run-time system for distributed memory MIMD architecture
RR-0564	11.1		include more mantissa digits in floating point	run-time system performance and memory
AI-00812	2.2		Attributes	Run-time system should avoid entering
RR-0019	4.2		Allow types to specify finalization procedures for	safe conversion between ADDRESS values and access/
AI-00812	2.2		Attributes SAFE_LARGE and	safe numbers
RR-0435	9.3		Need secondary standard for simple Ada subset for	Allow implementation freedom to
RR-0229	13.4	to ensure these/	Need to hide the range of a	SAFE_LARGE and SAFE_SMALL should be static
RR-0677	2.2.2		Allow initialization clauses on	safely controlling use of collections
RR-0155	12.3.3		Define RANGE attribute for	SAFE_SMALL should be static
RR-0304	12.3.3		Define RANGE attribute for	safety-critical applications
AI-00873	2.3		Type conversion/qualification of undefined	scalar type and the initial value of an object
RR-0693	2.2		Parameter passing rules for	scalar type declarations
RR-0656	5.1		Need timed exceptions for deadline	scalar types
RR-0379	5.2		Application should select the specific	scalar values
RR-0016	5.2		Allow user-selectable task	scalars makes generic code sharing hard
RR-0170	5.2		Permit or provide alternate	scheduling
RR-0124	5.2		Ensure that code dependent on task	scheduling algorithm
RR-0121	5.2		Provide more user control over	scheduling algorithms
RR-0278	5.2		Tasking model should support common	scheduling algorithms
RR-0219	4.5		the last raised exception, including an out-of-	scheduling algorithms is portable
RR-0740	2.2		to inlined subprograms, allow merging of	scheduling decisions
RR-0763	2.3		Allow nested	scheduling disciplines more easily
RR-0089	4.6		Provide facilities for I/O	scope exception
RR-0351	13.7		Trusted systems require auto-	/a way to get the name of
RR-0435	9.3	safety-critical applications	Need	For optimization with respect
RR-0375	13.7		Include formal memory protection/	scopes to turn off pragma SUPPRESS
RR-0647	4.1	case statements	Need ability to	screen operations
RR-0193	5.2		inheritance, and prioritized treatment of open	scrubbing of memory when done with it
RR-0199	12.3.13		Allow IF, CASE, and	secondary standard for simple Ada subset for
RR-0015	5.2		Allow task priorities to control all queuing/	security
RR-0737	5.2		control over selection of alternatives in a	select actions depending on state without using
RR-0340	12.3.13		Allow optional simple name on CASE, IF, and	select alternatives
RR-0379	5.2		Application should	/priority queues, priority
RR-0016	5.2		Allow user-	SELECT constructs to be named
RR-0462	12.3.7	formal part even when the selected/	Allow	select decisions
RR-0462	12.3.7	/of type mark in a formal part even when the	Allow	select statement
RR-0737	5.2		Allow reliable user control over	Allow reliable user
RR-0076	5.2	open alternatives based on priorities	Allow	SELECT statements
RR-0529	13.5	queries about properties of types	Allow	select the specific scheduling algorithm
RR-0614	12.3.4		Allow WHEN condition RETURN to make	selectable task scheduling algorithms
				selected component form of type mark in a
				selected component has the same identifier as/
				selection of alternatives in a select statement
				selection of entry calls from entry queues and
				selection of operations based on run-time
				selection of returned value clearer

RR-0679	13.4	Allow component	selection on objects of a private type
RR-0575	2.2.9	Need better (more	selective) control over inlining
RR-0624	12.2.3	Provide	selective direct visibility into a package
RR-0727	12.2.3	Need	selective direct visibility of package declarations
RR-0398	2.2.9	Need clearer/more	selective rules for pragma INLINE applicability
RR-0555	12.2.3	and subprograms of a type	"selective" USE clause to get just operators
RR-0415	5.2	prioritized entry-queues, and prioritized	selective wait
RR-0612	13.3	Should allow both delay and terminate alternatives in	selective wait
RR-0697	5.2	Allow entry call alternative in	selective wait
RR-0083	5.3	transfer of control via entry call/	selective wait construct
RR-0498	5.2	accept statements and entry calls	selective wait symmetrical with respect to
RR-0292	2.1	Section 13.6 of the standard has no	semantic content
RR-0732	2.4	an integer type	semantics of instantiating ENUMERATION_IO with
RR-0109	8.1	single distributed Ada program	semantics that are helpful when dealing with a
RR-0461	5.2	Provide standard package of	semaphore operations
RR-0185	5.2	General Ada rendezvous is slow;	semaphores would be better
RR-0028	13.4	Add a	semicolon terminator to SEPARATE statement syntax
RR-0392	13.5	predefined =	"semi-limited" type with predefined := but no
AI-00003	13.1	Allow data of mode IN in	SEND_CONTROL
RR-0480	8.1	Need standard means of	sending messages between Ada programs
RR-0237	4.3	particular library model	separate compilation independent of a
RR-0562	4.4	and bodies	separate compilation of generic specifications
RR-0171	4.3	/target-dependent code (including rep clauses) to be	separate from other code
RR-0537	13.6	in Pascal	Separate integer divide and floating divide as
RR-0698	4.3	separate units	separate portable and non-portable code into
RR-0774I	13.1	Need ability to	separate standards, such as X-Windows, SQL
RR-0028	13.4	Create	SEPARATE statement syntax
RR-0698	4.3	Add a semicolon terminator to	separate units
RR-0065	4.3	to separate portable and non-portable code into	Need ability
RR-0208	13.4	/allow rep clauses and various pragmas to be	separated from the compilation unit to which/
RR-0520	13.1	Need ability to initiate TEXT_IO, DIRECT_IO, and	SEQ_IO operations without waiting for/
RR-0593	4.6	Language should distinguish	"sequence" and "mapping" arrays
RR-0626	6.2	of variant record I/O in DIRECT_IO/	SEQUENTIAL_IO
RR-0021	5.2	among compilers, even for/	MANDATE implementation
RR-0347	5.2	Files produced by	SEQUENTIAL_IO and DIRECT_IO are not portable
RR-0749	12.3.11	Need priority inheritance for	server tasks
RR-0031	13.5.3	priority to increase as a function of lack of	service
RR-0034	3.1	Should allow index sliding for slices	/under program control; allow task
RR-0148	3.1	Provide a way to test for a value in a non-contiguous	serving as actual parameters and as values in record/
RR-0438	3.1	Ada should use ISO 8859/1-9 (8-bit) character	set
RR-0311	3.1	for extended and graphic characters (256 ASCII	set
RR-0283	4.3	Allow use of multi-octet character	set)
RR-0173	13.3	Generalize character	set)
RR-0370D	5.2	Need convenient way to	set for 8-bit characters
RR-0464	12.3.5	rendezvous with a higher-level entity, i.e., a	set global compilation parameters
RR-0648	12.3.5	Need to	set of tasks
RR-0105	5.1	Should be able to	set priorities of tasks during mode shifts
RR-0046	13.5.3	Need to	set STORAGE_SIZE for task objects as well as types
RR-0367	3.1	Allow application to	set STORAGE_SIZE on task objects, not task types
RR-0448	4.3	Allow testing in discontinuous ranges and create true	set/adjust clocks
RR-0481	2.1	Need support for national language character	sets
RR-0532	2.2.6	Allow different	sets, including string comparison
RR-0678	7.1	Make Ada documentation available in	sets of subprograms to depend on common declarations
RR-0119	7.1	record components in different variants to	SGML format
RR-0678	7.1	Pragma SHARED is not sufficient for data	share name
RR-0521	5.2	Need synchronized reference to elements of	shared between programs; need VOLATILE
AI-00142	7.1	between programs; need VOLATILE	shared composite objects
RR-0434	7.1	Need more convenient support for use of	SHARED is not sufficient for data shared
RR-0342	4.4	Allow pragma	shared memory among tasks
RR-0693	2.2	Need atomic read/write operations on	SHARED to be applied to components of composite objects
RR-0005	4.4	Do not implement requests that will break generic code	shared volatile memory
RR-0139	6.1	Parameter passing rules for scalars makes generic code	sharing
RR-0766	6.1	Exception declarations in generic packages make code	sharing hard
RR-0634	6.1	Provide	sharing unnecessarily difficult
RR-0136	6.1	Allow bit-wise operations (AND,	shift and rotate operations for boolean arrays
RR-0370D	5.2	Provide arithmetic	SHIFT) on integers, bytes, etc
RR-0280	5.1	Provide support for bit-field operations such as	shift operations for integers
RR-0265	13.7	Need to set priorities of tasks during mode	shift, rotate
		unnecessary; timing performance must be/	shifts
		Allow implementations to	Short delays are too inefficient; Calendar time
			short-circuit in general, forget AND THEN

RR-0061	2.4	Make Long_Float and Short_Float required types
RR-0517	9.3	Provide syntax to declare program units free from side-effects
RR-0453	11.1	Provide a special function or attribute yielding the sign of a numeric value
RR-0077	13.4	Provide stream I/O for digital signal processing
RR-0120	4.2	Allow users to defer the signalling of STORAGE_ERROR when space is exhausted
RR-0037	5.2	Allow tasks (i.e., delays) to execute using simulated time rather than a real-time clock
RR-0700	13.1	Ensure that constant functions like sin(10.0) are evaluated at compile-time
RR-0060	2.2.9	of subprograms from some but not all call sites
RR-0774E	4.5	Provide access to context of an exception situation
RR-0315	2.4	/integer type names that indicate representation size, e.g., INTEGER_32, to improve portability
RR-0464	12.3.5	Should be able to set STORAGE_SIZE for task objects as well as types
AI-00453	12.3.5	STORAGE_SIZE for tasks
RR-0717	2.2.12	Allow specification of a step size in FOR loops
RR-0463	13.4	Size is unclear; perhaps need 'Spacing and 'Allocation
RR-0648	12.3.5	SIZE on task objects, not task types
RR-0703	12.3.5	SIZE on task objects, not task types
RR-0018	6.4	Need pre-elaborated constant arrays with variable-sized elements
RR-0138	6.1	Need full-sized unsigned integers
RR-0553	4.6	GET_LINE should not automatically call SKIP_LINE
AI-00488	4.6	routines causes problems in interactive I/O
AI-00605	4.6	is inconsistent with other GET/GET_LINE
RR-0323	13.4.2	Generalize
RR-0494	13.4.2	Allow
RR-0508	13.4.2	Allow
RR-0240	12.3.11	Non-sliding aggregates and slices in component associations
RR-0749	12.3.11	values in/ Should allow index sliding for slices serving as actual parameters and as
RR-0573	12.3.11	component initialization and as components of/ Slide indices of array aggregates for record
RR-0240	12.3.11	Non-sliding aggregates and slices in component associations
RR-0749	12.3.11	and as values in record/ Should allow index sliding for slices serving as actual parameters
AI-00521	13.3	Fixed point subtypes should not inherit SMALL
RR-0565	2.2	representation clauses inappropriate
AI-00519	2.2	Default
AI-00812	2.2	Attributes SAFE_LARGE and SAFE_SMALL
RR-0210	13.7	Need more pragmas for software maintenance to MIL standards
RR-0087	6.3	Allow software priorities to match/exceed hardware priorities
RR-0162	13.1	Provide a clean interface to a SORT package
RR-0339	13.1	Support sorting in extended alphabets
RR-0746	13.7	Allow pictures/graphics as comments in source code
RR-0370A	8.2	reconfiguring a system Can't recover
RR-0370E	4.2	created by an allocator Need to recover
RR-0495	13.6	Remove leading space in the result of the 'IMAGE attribute for integers
RR-0120	4.2	to defer the signalling of STORAGE_ERROR when space is exhausted
RR-0112	4.2	Provide user support for controlled space reclamation
RR-0463	13.4	'Size is unclear; perhaps need 'Spacing and 'Allocation
RR-0082	2.2.5	of objects of private types in visible package specification
RR-0675	12.3.7	identifier to be used as a type mark in its specification
RR-0725	12.4.1	Need rename in package body for routine in package specification
RR-0268	13.6	Separation of specification and body is not worth it
RR-0153	13.1	Private part foils separation of specification and implementation
RR-0717	2.2.12	Allow specification of a step size in FOR loops
RR-0471	13.6	calls for clarity Allow specification of parameter modes in subprogram
RR-0270	13.4	Allow specification of read-only data from a package
RR-0701	13.4	for SYSTEM Allow specification of STANDARD in the same way as
RR-0030	13.6	referred to Require subprogram specification to list non-local objects
RR-0547	2.2	Like non-generic subprograms, allow merge of specification/body for generic subprograms
RR-0604	2.2	Like non-generic subprograms, allow merge of specification/body for generic subprograms
AI-00280	2.2	Allow pragma OPTIMIZE in package specifications
RR-0187	2.4	Need to allow unsigned enumeration representation specifications
RR-0562	4.4	Require separate compilation of generic specifications and bodies
RR-0267	2.1	The Standard is confusing in distinguishing specifications and declarations
RR-0581	12.2.1	error-prone and unhelpful Rules specifying the position of pragma ELABORATE are
RR-0774I	13.1	Create separate standards, such as X-Windows, SQL
RR-0719	11.1	Need standard for trig functions, sqrt, etc
AI-00510	3.1	Use ISO symbols and standards in the Ada ISO Standard
RR-0091	4.3	Don't specify the compilation process in the Standard
RR-0299	13.1	Make everything in the Standard "part of the" standard
RR-0314	13.7	Define minimum-quality error diagnostics in the standard
RR-0382	4.6	Need to be able to rename and append to a file in standard Ada

RR-0252A	11.1	Ensure support for IEEE floating point	standard; allow full use of machine/
RR-0731	11.1	Use the Language Compatible Arithmetic	Standard as a basis for Ada's floating point model
RR-0318	2.1	Make a machine-readable version of the	Standard available (with embedded mark-up)
RR-0084	5.2	permit high-performance/	Specify
RR-0435	9.3	safety-critical applications	Need secondary
RR-0719	11.1		Need
RR-0292	2.1		Section 13.6 of the
RR-0369	11.1	Provide support for floating point	standard IEEE-754
RR-0701	13.4	Allow specification of	STANDARD in the same way as for SYSTEM
AI-00485	4.6	for interactive I/O	Having independent
RR-0582	4.5	implementation-dependent info about/	Provide
RR-0267	2.1	specifications and declarations	The
RR-0683	2.2		Section 11.6 of the
RR-0260	2.1		The
RR-0181	8.1		Need
RR-0378	8.1		Need
RR-0480	8.1		Need
AI-00216	10.2	are numeric, upper case, lower case/	Provide
AI-00582	13.4		Need a
RR-0748	5.4		Provide
RR-0774B	13.6		Tasking defined as a
RR-0159	4.6		Add
RR-0461	5.2		Provide
RR-0299	13.1		Make everything in the
RR-0074	5.2		Define a
RR-0501	2.1	section headings	The
RR-0502	2.1	upper and lower cases	The
RR-0068	2.4	support is optional for embedded systems	The
RR-0189	11.1	library interface	
RR-0644	9.1	for certain operations	
RR-0622	2.1	generic formal types	The
RR-0051B	10.4		Provide
RR-0479	13.1	information from OS	Need
RR-0590	5.2		Need clear, efficient,
RR-0151	6.3		Need
RR-0245	8.2		Change
RR-0386	9.1		Need
RR-0137	2.4		
RR-0527	4.1	pragma INTERFACE	
RR-0177	4.3	library for configuration management	
RR-0355	2.4	line arguments	
RR-0681	13.7	A definition of an Ada Line Of Code (LOC) should be	
RR-0345	13.1		Need
RR-0602	met	Encourage implementors to support	
RR-0226	4.3	management capabilities	Need
RR-0210	13.7	Need more pragmas for software maintenance to MIL	
RR-0325A	9.3	Allow implementations to enforce local coding	
AI-00510	3.1	Use ISO symbols and	
RR-0774I	13.1	Create separate	
RR-0306	5.1	Need to be able to	
RR-0132	12.3.4	on RAISE statement for consistency with EXIT	statement
RR-0216	9.3	Require that each task entry have at least one accept	statement
RR-0281	2.1	Confusing treatment of term "delay"	statement
RR-0362	12.3.4	Allow optional when_clause on the raise	statement
RR-0491	13.1.2	Code would be clearer if one could EXIT from a block	statement
RR-0538	9.3	Create new loop structure which bans the EXIT	statement
RR-0618	13.1	Ban GOTO	statement
RR-0737	5.2	over selection of alternatives in a select	statement
RR-0650	13.5.2	Allow non-static case	statement choices, non-discrete case statement expression
RR-0620	13.6	Ban RETURN	statement except inside functions
RR-0650	13.5.2	case statement choices, non-discrete case	statement expression
RR-0632	13.1.2	Allow EXIT from a block	statement for consistency
RR-0132	12.3.4	Allow optional WHEN <condition> on RAISE	statement for consistency with EXIT statement
RR-0320	13.5	Generalize case	statement for other types, including REAL
RR-0335	5.3	Effect of abort	statement is too implementation-dependent
RR-0658	5.2	Allow accept	statement possibility in a conditional entry call
RR-0028	13.4	Add a semicolon terminator to SEPARATE	statement syntax
RR-0312	13.5	Generalize case	statement to decision table

AI-00211	13.4	Additional control	statement to hop to end of the loop
RR-0561	13.5.2	Allow case	statement to operate on strings for string processing
RR-0141	12.3.4	Allow WHEN <condition> on RAISE	statements
RR-0200	12.3.4	Allow optional when_clause on RAISE and RETURN	statements
RR-0340	12.3.13	Allow optional simple name on CASE, IF, and SELECT	statements
RR-0499	12.3.2	"blocks", allow exception handlers in accept	statements
RR-0647	4.1	actions depending on state without using case	statements
RR-0498	5.2	wait symmetrical with respect to accept	statements and entry calls
AI-00214	2.2.7	Allow accept	statements in program units nested in tasks
RR-0543	2.2.7	Allow accept	statements in subprograms nested inside tasks
RR-0621C	13.4	Allow case	statements to dispatch on value of an exception
AI-00477	13.5.2	Case choices should not have to be	static
AI-00812	2.2	Attributes SAFE_LARGE and SAFE_SMALL should be	static
RR-0271	13.6	for variables with key words like CONTROLLED or	STATIC
RR-0341	2.2	value in record aggregate to be non-	static
RR-0650	13.5.2	case statement expression	static case statement choices, non-discrete
RR-0009	12.3.6	Allow static conversion to	static discrete type of static discrete expression
RR-0099	12.3.6	Explicit type conversions should be allowed in	static expressions
RR-0246	8.2	elaborated at run time when initialized with	static expressions
RR-0705	2.2	For better performance, remove restrictions on	static expressions
RR-0452	13.4	Allow constant functions in	static expressions (or overloadable constants)
RR-0048	2.2.4	attributes of composite types	static expressions to include representation
RR-0227	4.4	Allow generic parameterization with	static numeric quantities
RR-0338	6.4	ADDRESS values and access/	static objects and safe conversion between
RR-0726	6.4	Need non-contiguous arrays,	static pointers
RR-0654	5.2	Need non-	static priorities
RR-0616	2.3	Require compilers to diagnose	statically-detectable constraint errors
RR-0445	4.4	Non-	staticness of generic formal poses problems
RR-0717	2.2.12	Allow specification of a	step size in FOR loops
RR-0742	5.3	Need ability to asynchronously	stop another task
RR-0431	5.3	A terminate alternative cannot be used to	stop cyclic tasks
RR-0768	5.3	Need to asynchronously interrupt another task to	stop it
RR-0475	4.2	user-defined routines to reclaim	storage
AI-00570	12.1.1	Releasing heap	storage
RR-0271	13.6	like CONTROLLED or STATIC	storage associated with task type instances
RR-0113	4.2	Distinguish	storage classes for variables with key words
RR-0168	4.2	Ensure that there are no	storage "leaks"
RR-0702	4.2	Allow implicitly-invoked finalization code for	storage management
RR-0118	4.2	There is a need for improvements in heap	storage management
RR-0291	6.4	Provide a user-specified	storage reserve for STORAGE_ERROR recovery
RR-0017	6.2	Clarify whether use of an address clause causes	storage to be initialized
RR-0493	4.2	Be able to treat an Ada object as an array of	storage units
RR-0118	4.2	A programmer should be able to ensure that	storage will be reclaimed
RR-0120	4.2	Provide a user-specified storage reserve for	STORAGE_ERROR recovery
RR-0137	2.4	Allow users to defer the signalling of	STORAGE_ERROR when space is exhausted
RR-0464	12.3.5	Standardize bit	storage/order conventions
AI-00453	12.3.5	Should be able to set	STORAGE_SIZE for task objects as well as types
RR-0648	12.3.5	Need to set	STORAGE_SIZE for tasks
RR-0703	12.3.5	Need to specify	STORAGE_SIZE on task objects, not task types
RR-0176	9.1	system performance and memory allocation	STORAGE_SIZE on task objects, not task types
RR-0077	13.4	Provide	strategies
RR-0310	10.4	Need convenient way to pad with blanks in	stream I/O for digital signal processing
RR-0367	3.1	for national language character sets, including	string assignments
RR-0051C	10.4	Provide packages for	string comparison
RR-0295	4.6	Create TEXT_IO.PUT_LINE for types other than	string edit functions
RR-0324	10.4	Add more flexible support for	string (make like PUT)
RR-0051B	10.4	Provide standard	string manipulation
RR-0561	13.5.2	Allow case statement to operate on	string manipulation packages
RR-0054	13.2	Do not add variable length	strings for string processing
RR-0327	10.4	Add varying length	strings to the language
RR-0419	10.4	Add some form of support for varying length	strings to the language
RR-0163	10.4	Need support for variable-length	strings to the language
RR-0421B	6.3	/structure is sometimes different from memory address	strings with appropriate equality and assignment/
RR-0615	2.2.12	Define LOOP/UNTIL control	structure; a single type for both is/
RR-0289	6.2	Need multiple views of a record	structure as in Pascal
RR-0282	13.3	Ada program	structure even when no discriminant is present
RR-0421B	6.3	Interrupt address	structure hides important context information
RR-0457	4.3	address structure; a single/	structure is sometimes different from memory
		visibility of library units	Structure library units as groups, control

RR-0538	9.3		Create new loop	structure which bans the EXIT statement
RR-0639	8.2		Need compile-time initialization of complex data	structures
RR-0103B	6.2		Provide efficient means of reading large data	structures in chunks
RR-0262	13.7		Do not require existence of subunit for body	stubs
RR-0234	12.1.2	implementation burden		"Sub-null" ranges are of little value and an
RR-0462	12.3.7		component has the same identifier as the	subprogram /formal part even when the selected
RR-0081	4.1		Provide	subprogram and package types
AI-00382	2.2		Allow generic	subprogram bodies
RR-0557	4.3		The use of renaming declarations to provide	subprogram bodies helps get around the/
RR-0764	12.4.1		Allow	subprogram bodies to be defined by RENAMES
RR-0550	12.4.1	generic instantiation	Allow	subprogram bodies to be defined by RENAMES or
RR-0157	12.4.1		Allow renaming when defining a	subprogram body
RR-0231	12.4.1		Allow a rename definition of a	subprogram body
RR-0470	12.4.1		Allow renaming or generic instantiation to define a	subprogram body
RR-0688	4.3		Unnecessary recompilation required when redeclaring a	subprogram body
RR-0364	12.4.1		Allow a	subprogram body to be defined by generic instantiation
RR-0055	12.4.1	generic instantiation	Allow a	subprogram body to be defined by renaming or
RR-0666	12.4.1		Allow a	subprogram body to be given by generic instantiation
RR-0667	12.4.1		Allow a	subprogram body to be given by RENAMES
RR-0388	4.1		Proposal for clean way of executing a	subprogram by its address
RR-0458	4.4		Need convenient way to escape into weakly typed	subprogram call
RR-0064	4.1		Allow some form of	subprogram callback
RR-0629	4.1		Need procedure and function types for use in	subprogram calls
RR-0471	13.6		Allow specification of parameter modes in	subprogram calls for clarity
RR-0675	12.3.7	in its specification	Allow a	subprogram identifier to be used as a type mark
RR-0579	12.3.7		Allow a type mark of form P.FOO in the formal part of a	subprogram named FOO
RR-0606	13.5.4		Allow generic	subprogram names to be overloaded
RR-0414	4.1		Ada needs subprogram types and	subprogram objects
RR-0214	13.1		Require that a	subprogram parameter be used within the body
RR-0518	13.1		Provide syntax to declare	subprogram pre/post conditions
RR-0030	13.6	objects referred to	Require	subprogram specification to list non-local
RR-0774M	13.1		Allow a	subprogram to be renamed in a body
RR-0483	12.3.7	generic unit (as is/	Allow an instantiated	subprogram to have the same identifier as the
RR-0430A	4.1		Need objects of a	subprogram "type"
RR-0414	4.1		Ada needs	subprogram types and subprogram objects
RR-0563	4.1		Need to allow	subprogram types and variables
RR-0503	4.1		Provide	subprogram types for dispatcher-style programming
RR-0611	4.1	parameters, etc	Allow	subprogram types, variables, constants,
RR-0169	13.4		procedures for actual or default generic formal	subprogram values
RR-0384	5.1	specified delay	Cannot write	subprogram which causes an exception after
RR-0032	12.2.2		Allow grouping of variable declarations and related	subprograms
RR-0101B	4.4		exceptions as parameters to generic units and	subprograms
RR-0426B	2.2		Allow declaration and body to be combined for generic	subprograms
RR-0468	4.4		to handle exceptions raised by generic formal	subprograms
RR-0488	4.4		formal entries as well as generic formal	subprograms
RR-0512	4.1		Provide subprograms as parameters to	subprograms
RR-0526B	4.4		exceptions as parameters to generic units and	subprograms
RR-0547	2.2		allow merge of specification/body for generic	subprograms
RR-0604	2.2		allow merge of specification/body for generic	subprograms
RR-0547	2.2	for generic subprograms	Like non-generic	subprograms, allow merge of specification/body
RR-0604	2.2	for generic subprograms	Like non-generic	subprograms, allow merge of specification/body
RR-0740	2.2		For optimization with respect to inlined	subprograms, allow merging of scopes
RR-0128	4.1		Provide subprograms as parameters to	subprograms and entries
RR-0033B	4.4		Need to pass exceptions to	subprograms and generic units
RR-0069	4.3	without modifying the original package	Allow	subprograms and types to be added to a package
RR-0430B	4.1		Need to pass	subprograms as parameters
RR-0774K	4.1		Allow	subprograms as parameters
RR-0422	4.1		Allow	subprograms as parameters and maybe also as values
RR-0512	4.1		Provide	subprograms as parameters to subprograms
RR-0128	4.1		Provide	subprograms as parameters to subprograms and entries
RR-0641	4.1		Add	subprograms as parameters to the language
RR-0060	2.2.9		Allow inlining of	subprograms from some but not all call sites
RR-0014	4.1		Need to call	subprograms loaded in ROM
RR-0543	2.2.7		Allow accept statements in	subprograms nested inside tasks
RR-0269	13.6		Make	subprograms not recursive by default
RR-0555	12.2.3		Need "selective" USE clause to get just operators and	subprograms of a type
RR-0448	4.3		Allow different sets of	subprograms to depend on common declarations
RR-0479	13.1		Need standard	subprograms to get user-interface information from OS

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RR-0515	4.2	for specific objects, especially in distributed	systems	/ability to request indivisible update
RR-0351	13.7	done with it	Trusted	systems require auto-scrubbing of memory when
RR-0626	6.2	/not portable among compilers, even for the same	target machine e.g., because of dope vectors	
RR-0554	9.1	Need constraint checks for	target of Unchecked_Conversion and I/O input	
RR-0476	13.6	functions with the same name as the	target type	Allow user-written type-conversion
RR-0171	4.3	to be separate from other code	Allow	target-dependent code (including rep clauses)
RR-0175	5.2	Define interface between compiler- and		target-specific run-time system aspects
AI-00450	5.3	Should allow raising of an exception in another	task	
RR-0380	7.2	Need a task identifier for every	task	
RR-0487	2.2.11	Need private task entries for exclusive use within the	task	
RR-0651	5.3	Allow one task to raise an exception in another	task	
RR-0742	5.3	Need ability to asynchronously stop another	task	
RR-0013	2.1	than task execution	Allow	task activation to occur at a higher priority
RR-0394	13.3	Merge concepts of	task and package into concept of an object	
RR-0711	4.6	I/O by a task in multi-	task application should not block whole program	
RR-0108	5.1	Need to be able to wake up a	task at a particular local time	
RR-0774N	4.2	Allow	task cleanup on termination of parent	
RR-0183	5.4	Asynchronous inter-	task communication is not available	
RR-0133	7.2	Allow a	task component of an array to get its index	
RR-0370E	4.2	an allocator	Need to recover space for	task control blocks when tasks are created by
RR-0628	2.2.11	Need private	task entries	
AI-00451	4.4	Task entries as formal parameters to generics		
RR-0487	2.2.11	Need private	task entries for exclusive use within the task	
RR-0710	6.3	Need to tie	task entries to asynchronous external events	
RR-0090	2.2.11	Allow some	task entries to be visible, some not	
RR-0056	met	Do not remove	task entry families	
RR-0216	9.3	Require that each	task entry have at least one accept statement	
RR-0013	2.1	activation to occur at a higher priority than	task execution	Allow task
RR-0194	12.1.1	Disallow referencing a	task from outside its master	
RR-0380	7.2	Need a	task identifier for every task	
RR-0711	4.6	I/O by a	task in multi-task application should not block	
RR-0114	6.3	Allow an address clause for each	task instance, and not just on the type	
RR-0334	7.2	Need to specify task parameters giving a	task its work domain, e.g., to process part of an/	
RR-0286D	6.3	Interrupts should be handled with a procedure model, not a	task model	
RR-0195	6.3	Need interrupt address per	task, not task type	
RR-0427	12.1.1	permit a function to return a locally-declared	task object	Do not
RR-0464	12.3.5	Should be able to set STORAGE_SIZE for	task objects as well as types	
RR-0421C	6.3	Need to associate interrupts with entries of	task objects, not task types	
RR-0648	12.3.5	Need to set STORAGE_SIZE on	task objects, not task types	
RR-0703	12.3.5	Need to specify STORAGE_SIZE on	task objects, not task types	
RR-0104	12.1.1	Prohibit access to a	task outside its master	
RR-0334	7.2	e.g., to process part of an/	task parameters giving a task its work domain,	
RR-0015	5.2	Need to specify	task priorities to control all queuing/select decisions	
RR-0075	5.2	Allow	task priority or FIFO based on application	
RR-0347	5.2	Queue entries by	task priority to increase as a function of lack/	
RR-0016	5.2	/change priorities under program control; allow	task scheduling algorithms	
RR-0124	5.2	Allow user-selectable	task scheduling algorithms is portable	
RR-0436	2.1	Ensure that code dependent on	task synchronization point inconsistencies	
RR-0400	2.3	Clarify	task to die silently on an unhandled exception	
RR-0407B	2.3	Do not allow a	task to die silently on an unhandled exception	
RR-0651	5.3	Do not allow a	task to raise an exception in another task	
RR-0768	5.3	Allow one	task to stop it	
RR-0195	6.3	Need to asynchronously interrupt another	task type	
RR-0753	13.6	Need interrupt address per task, not	task type declarations more consistent	
AI-00570	12.1.1	Make syntax for	task type instances	
RR-0421C	6.3	Releasing heap storage associated with	task types	Need to associate
RR-0648	12.3.5	interrupts with entries of task objects, not	task types	
RR-0703	12.3.5	Need to set STORAGE_SIZE on task objects, not	task types	
RR-0486	4.4	Need to specify STORAGE_SIZE on task objects, not	task types	
RR-0774B	13.6	Allow generic formal	task types as well as generic formal limited types	
RR-0078	5	Ada	Tasking defined as a standard package of functions	
RR-0278	5.2	disciplines more easily	tasking is too complex, inflexible and inefficient	
RR-0279	2.2	and compiled code should not include code for	tasking model should support common scheduling	
AI-00214	2.2.7	Allow accept statements in program units nested in	tasking support	/not used, the run-time system
AI-00453	12.3.5	STORAGE_SIZE for	tasks	
RR-0021	5.2	Need priority inheritance for server	tasks	
RR-0023	2.1	Require TERMINATE alternative to terminate library	tasks	
RR-0173	13.3	with a higher-level entity, i.e., a set of	tasks	Allow a rendezvous

RR-0203	4.2	Allow finalization code for packages and	tasks	
RR-0370B	8.2	Can't restart library level	tasks	
RR-0410	5.1	Provide explicit language support for periodic	tasks	
RR-0431	5.3	alternative cannot be used to stop cyclic	tasks	A terminate
RR-0521	5.2	support for use of shared memory among	tasks	Need more convenient
RR-0543	2.2.7	Allow accept statements in subprograms nested inside	tasks	
RR-0580	2.2.7	within subprograms/packages nested inside	tasks	Allow accepts
RR-0587	5.4	Provide for communication between loosely coupled	tasks	
RR-0370E	4.2	Need to recover space for task control blocks when	tasks are created by an allocator	
RR-0279	2.2	compiled code should not include code for/	If tasks are not used, the run-time system and	
RR-0123	7.2	Provide initialization values to	tasks at startup	
RR-0370C	2.1	Library level	tasks can't terminate	
RR-0215	2.1	Clarify termination of	tasks dependent on library packages	
RR-0370D	5.2	Need to set priorities of	tasks during mode shifts	
RR-0063	5.3	critical functions	Protect tasks from being aborted while performing	
RR-0037	5.2	time rather than a real-time clock	Allow tasks (i.e., delays) to execute using simulated	
RR-0686	6.3	Priority of interrupts higher than normal	tasks is ill-conceived	
RR-0084	5.2	Specify standard conventions for using	tasks that permit high-performance/	
RR-0771	9.3	Require	tasks to have an accept for each entry	
RR-0661	8.2	Need language features for assigning	tasks to nodes	
RR-0496	2.1	Clarify termination of	tasks whose masters are library units	
RR-0281	2.1	Confusing treatment of	term "delay statement"	
RR-0235	4.6	Need support for interactive	terminal input/output	
RR-0164	4.6	Provide multitasking	terminal I/O in TEXT_IO	
RR-0370C	2.1	Library level tasks can't	terminate	
RR-0079	13.6	rarely used	TERMINATE alternative adds little value and is	
RR-0431	5.3	cyclic tasks	terminate alternative cannot be used to stop	
RR-0023	2.1		TERMINATE alternative to terminate library tasks	
RR-0612	13.3		terminate alternatives in selective wait	
RR-0023	2.1	Require TERMINATE alternative to	terminate library tasks	
RR-0774N	4.2	Allow task cleanup on	termination of parent	
RR-0215	2.1	Clarify	termination of tasks dependent on library packages	
RR-0496	2.1	Clarify	termination of tasks whose masters are library units	
RR-0028	13.4	Add a semicolon	terminator to SEPARATE statement syntax	
AI-00605	4.6	inconsistent with other GET/	terminators at the end of the line, which is	
AI-00488	4.6	interactive I/O	terminators in GET routines causes problems in	
AI-00329	4.6	Look-ahead operation for	TEXT_IO	
RR-0164	4.6	Provide multitasking terminal I/O in	TEXT_IO	
RR-0360	10.4	Add picture-formatting capabilities to	TEXT_IO	
RR-0208	13.4	without waiting for/	TEXT_IO, DIRECT_IO, and SEQ_IO operations	
RR-0333	13.3	Need ability to initiate	TEXT_IO is needed, less implementation freedom	
RR-0484	4.6	More precise definition of	TEXT_IO packages	
RR-0207	4.6	Add DEFAULT_xy functionality as parameters to generic	TEXT_IO support with Exists function and Append/	
RR-0551	4.6	Need assignment capability for	TEXT_IO.FILE_TYPE	
RR-0047	4.6	Add	TEXT_IO.GET functions	
RR-0295	4.6	(make like PUT)	TEXT_IO.PUT_LINE for types other than string	
RR-0265	13.7	to short-circuit in general, forget AND	THEN	Allow implementations
RR-0514	7.3	Provide support for simple parallel	threads within a program unit	
RR-0257	2.1	Ensure that BOOLEAN and BYTE arrays can be	tightly packed	
RR-0158	13.3	Allow multi-way conditional and	timed entry calls	
RR-0656	5.1	Need	timed exceptions for deadline scheduling	
RR-0421D	6.3	The treatment of interrupts as ordinary,	timed, or conditional calls may depend/	
RR-0286A	5.2	Embedded system users need the ability to control	timer utilities	
AI-00519	2.2	Default SMALL should be a power of two	times the range	
RR-0276	5.1	specified accuracy and precision control over	timing	Need user
RR-0107	5.1	Allow application to specify clock	timing interval if hardware allows this flexibility	
RR-0280	5.1	/delays are too inefficient; Calendar time unnecessary;	timing performance must be documented	
RR-0368B	4.3	Ensure the library can be manipulated by	tools other than those provided by the compiler/	
RR-0665A	5.4	Support multicast message	transfer	
RR-0106	5.3	Provide asynchronous	transfer of control	
RR-0083	5.3	wait construct	transfer of control via entry call/selective	
RR-0004	12.2.1	Pragma ELABORATE should be	transitive	
RR-0233	12.2.1	Pragma ELABORATE should be	transitive	
RR-0773	6.2	variable-length records into a block for data	transmission	Need to pack
RR-0017	6.2	Be able to	treat an Ada object as an array of storage units	
RR-0699	13.3	an error	treat an unaccepted length clause for a type as	
RR-0376	13.3	Need special	treatment of exceptions in/	
RR-0421D	6.3	conditional calls may depend/	The treatment of interrupts as ordinary, timed, or	

RR-0179	6.3		The	treatment of interrupts is too implementation-dependent
RR-0193	5.2	/priority queues, priority inheritance, and prioritized		treatment of open select alternatives
RR-0281	2.1		Confusing	treatment of term "delay statement"
RR-0719	11.1		Need standard for	trig functions, sqrt, etc
RR-0348	11.1	Need predefined functions for real numbers, e.g.,		trig, log, etc
RR-0358	11.1	Need support for floor, ceiling,		truncate, and whole operations
RR-0552	13.4	Need "padded" line input with		truncation and pad-fill to 'LENGTH
RR-0252B	11.1	/needs to know/control whether rounding or		truncation is used in real calculations
RR-0478	13.1	facilities for restricting use of resources to		trusted packages
RR-0351	13.7	memory when done with it		Trusted systems require auto-scrubbing of
AI-00327	2.2.5	Instantiating with an incomplete private		type
AI-00538	13.4	Declaring constant arrays with an anonymous		type
AI-00681	13.4	Can't declare a constant of a NULL record		type
RR-0010	2.2	private type with discriminants to be a derived		type
RR-0114	6.3	for each task instance, and not just on the		type
RR-0129	2.2.2	to be specified for any non-limited		type
RR-0131	13.4	of the enumeration literals of the qualifying		type
RR-0161	2.2.2	Allow default initialization for any non-limited		type
RR-0166	13.3	the literal representations of an abstract data		type
RR-0184	4.2	assignment operator for limited private		type
RR-0195	6.3	Need interrupt address per task, not task		type
RR-0430A	4.1	Need objects of a subprogram		"type"
RR-0474	12.2.3	to just enumeration literals and operators of a		type
RR-0476	13.6	functions with the same name as the target		type
RR-0513	12.3.9	of = for any type, e.g., returning an array		type
RR-0551	4.6	Need assignment capability for TEXT_IO.FILE_		TYPE
RR-0555	12.2.3	to get just operators and subprograms of a		type
RR-0577	2.2	a component of an incompletely declared private		type
RR-0679	13.4	Allow component selection on objects of a private		type
RR-0732	2.4	of instantiating ENUMERATION_IO with an integer		type
RR-0302	2.4	The language should define literals for values of		type ADDRESS
RR-0467	12.2.3	Need convenient way to rename a		type and get its operations
RR-0229	13.4	Need to hide the range of a scalar		type and the initial value of an object to ensure/
RR-0699	13.3	Do not treat an unaccepted length clause for a		type as an error
RR-0542	2.2.5	One way or another allow usage of private		type before its completion declaration
RR-0239B	2.2.3	A renamed		type cannot be used in an actual parameter type conversion
RR-0531	4.3	variant record approach		type can't be usefully supported with current
AI-00420	3.1	Allow 256 values for		type CHARACTER
RR-0239B	2.2.3	A renamed type cannot be used in an actual parameter		type conversion
AI-00873	2.3	scalar values		Type conversion/qualification of undefined
RR-0510	2.2.10			type conversions
RR-0715	2.2	Re-indexing arrays via		type conversions and attributes for numeric types
RR-0099	12.3.6	Allow user-defined		type conversions should be allowed in static expressions
AI-00540	12.4.2	Explicit		type declarations with a subtype declaration
RR-0677	2.2.2	Completing a private		type declarations
RR-0259	13.7	Allow initialization clauses on scalar		type declarations are dangerous and unnecessary
RR-0753	13.6	Incomplete		type declarations more consistent
AI-00518	13.4	Make syntax for task		type declarations needlessly different
RR-0191	2.2	Fixed and floating		type definition
RR-0230	2.2.2	model numbers should include the bounds of the		type definition
RR-0456	2.2.2	Allow initialization to be associated with any		type definition
RR-0506	2.2.2	Allow initialization to be associated with a		type definition
RR-0566	2.2	Allow initialization to be associated with a		type definition
AI-00429	13.4.4	model numbers should include the bounds of the		type definition
RR-0492	11.1	Allow array		type definition for record component
RR-0336	13.4.4	and exponent information in floating point		type definitions
RR-0513	12.3.9	array-of-array case		type definitions in records; nice for
RR-0421B	6.3	Allow array		type, e.g., returning an array type
RR-0680	13.1	Allow overloading of = for any		type for both is inappropriate
RR-0627	4.4	/different from memory address structure; a single		type for exponent
RR-0577	2.2	Predefined exponentiation should take any integer		type for records
RR-0442	4.3	Allow partial match to formal		type having a component of an incompletely declared/
AI-00285	4.4	Allow deferred constant of composite		type hierarchy
AI-00570	12.1.1	Extend Ada to allow a package		type in some algorithms
RR-0450	6.4	Need to be able to access a base numeric		type instances
RR-0462	12.3.7	Releasing heap storage associated with task		type is determined at run time
RR-0675	12.3.7	Need efficient manipulation of buffers whose		type mark in a formal part even when the selected/
RR-0579	12.3.7	Allow selected component form of		type mark in its specification
		Allow a subprogram identifier to be used as a		type mark of form P.FOO in the formal part of a
		subprogram named FOO		

RR-0315	2.4	e.g., INTEGER_32, to improve/	Allow integer	type names that indicate representation size,
RR-0009	12.3.6	Allow static conversion to static discrete	type of static discrete expression	
AI-00479	12.3.10	Initialize access	type OUT parameters to null	
RR-0395	2.2	Include formal parameter names in parameter/result-	type profile	
RR-0600	2.2	Allow formal parameter names in parameter/result-	type profile	
RR-0532	2.2.6	share name	Allow same-	type record components in different variants to
RR-0558	13.4		Deriver of	type should be able to hide subset of derived operations
RR-0252D	2.2		Fixed point	type should include the bounds of the range definition
RR-C239A	12.2.3		Renaming an enumeration	type should make literals visible
RR-0096C	12.4.2	Allow the full declaration of a private	type to be provided by a renaming declaration	
RR-0466	4.2	Allow user-defined finalization for objects of a	type to ensure release of resources	
RR-0523	4.2	Allow user-defined finalization for objects of a	type to ensure release of resources	
RR-0010	2.2	Allow the full declaration of a private	type with discriminants to be a derived type	
RR-0392	13.5	Need "semi-limited"	type with predefined := but no predefined =	
AI-00345	4.6	Record	type with variant having no discriminants	
RR-0190	4.4	Allow use of a base	type within a generic unit	
RR-0511	4.4	Allow use of a base	type within a generic unit	
RR-0476	13.6	the target type	Allow user-written	type-conversion functions with the same name as
RR-0458	4.4	Need convenient way to escape into weakly	typed subprogram call	
RR-0596	12.3.13		Allow END	type_name to substitute for END RECORD
RR-0673	12.3.13		Allow "END RECORD"	type_name to substitute for "END RECORD"
AI-00291	4.1	package that works for all floating point	types	Can't define a generic
RR-0006	4.4	Distinguish unconstrained/constrained generic formal	types	
RR-0008	12.3.9	Allow overloading of the equality operator for all	types	
RR-0025	12.3.9	of the equality operator with different operand	types	Allow overloading
RR-0048	2.2.4	include representation attributes of composite	types	Extend static expressions to
RR-0058	13.5.3	Allow discontinuous subtypes of enumeration	types	
RR-0061	2.4	Make Long_Float and Short_Float required	types	
RR-0070	4.2	Allow user-defined assignment for limited	types	
RR-0081	4.1	Provide subprogram and package	types	
RR-0155	12.3.3	Define RANGE attribute for scalar	types	
RR-0160	4.2	Allow user-defined assignment for limited	types	
RR-0167	4.3	Allow classes of abstract data	types	
RR-0188	6.1	and bit-wise logical operations on integer	types	/applications need unsigned integers
RR-0304	12.3.3	Define RANGE attribute for scalar	types	
RR-0313	13.4	constants of arbitrary (i.e., non-private)	types	Allow deferred
RR-0363	12.3.1	to apply to real types as well as discrete	types	Allow 'VALUE and 'IMAGE
RR-0406	13.4.1	Allow user-defined attributes for user-defined	types	
RR-0412	12.3.9	Allow overloaded = for all types, not just limited	types	
RR-0413	4.2	Allow user-written := for all	types	
RR-0421C	6.3	with entries of task objects, not task	types	Need to associate interrupts
RR-0423	2.2	restriction on full declarations of private	types	Remove discriminant
RR-0433	6.1	There is a need for predefined unsigned integer	types	
RR-0437	13.5.3	Provide "supertype" capability for merging enumeration	types	
RR-0446	4.4	constrained/unconstrained generic	types	/the contract model by distinguishing
RR-0449	13.1	Do not allow unchecked conversion of private	types	
RR-0454	11.1	Need Entire function or attribute for real	types	
RR-0460	6.1	Ada needs to provide support for unsigned integer	types	
RR-0464	12.3.5	to set STORAGE_SIZE for task objects as well as	types	Should be able
RR-0472	4.4	Distinguish unconstrained/constrained generic formal	types	
RR-0486	4.4	task types as well as generic formal limited	types	Allow generic formal
RR-0505A	4.3	Provide extendable record	types	
RR-0509	13.4.1	attributes for user-defined or private	types	Allow user-defined
RR-0529	13.5	based on run-time queries about properties of	types	Allow selection of operations
RR-0530	13.3	Insufficient support for mutants of limited	types	
RR-0568	2.2	Allow non-nested variant parts in record	types	
RR-0572	13.1	with respect to all predefined integer	types	Need predefined operators
RR-0595	2.2.2	Allow default initialization for all	types	
RR-0603	13.5.3	Allow discontinuous subtypes of discrete	types	
RR-0609	4.2	Allow user-defined override of =, /=, := on all	types	
RR-0617	13.6	Eliminate anonymous array	types	
RR-0622	2.1	use "metatype" in describing generic formal	types	The Standard should
RR-0648	12.3.5	Need to set STORAGE_SIZE on task objects, not task	types	
RR-0660	4.2	Need constructors and destructors for package	types	
RR-0664	12.3.1	Need 'IMAGE and 'VALUE attributes for floating-point	types	
RR-0672	13.4	Need anonymous pointer	types	
RR-0703	12.3.5	specify STORAGE_SIZE on task objects, not task	types	Need to
RR-0715	2.2	type conversions and attributes for numeric	types	Allow user-defined

RR-0716	11.1	Unify and add attributes for numeric	types	
RR-0722	4.4	Need generic formal record	types	
RR-0741	7.3	Need hot performance on vector machines; add vector	types and operands	
RR-0414	4.1	Ada needs subprogram	types and subprogram objects	
RR-0610	2.2	Why not allow RENAMES for	types and subtypes?	
RR-0563	4.1	Need to allow subprogram	types and variables	
RR-0080	13.3	Derived	types are clumsy	
RR-0272	13.6	Limited	types are of little true value	
RR-0122	2.2	Permit an implementation to reject some integer	types as array indexes	
AI-00452	4.4	Allow record	types as generic formal parameters	
RR-0443	13.4.4	Need for anonymous array	types as record components	
RR-0363	12.3.1	Allow 'VALUE and 'IMAGE to apply to real	types as well as discrete types	
RR-0486	4.4	Allow generic formal task	types as well as generic formal limited types	
RR-0172	4.3	Make import and export of	types easier	
RR-0503	4.1	Provide subprogram	types for dispatcher-style programming	
RR-0629	4.1	Need procedure and function	types for use in subprogram calls	
RR-0533	4.3	Mutually recursive	types from different packages cannot be done	
RR-0482	4.3	Multiple derived	types from same package do not generate needed operations	
RR-0052	4.3	Multiple derived	types from same package do not give desired operations	
AI-00404	2.2	Use of incomplete private	types in generic formal part	
RR-0273	13.6	There are problems with private	types in the language	
RR-0389	13.4	There is a need for "cyclic" discrete	types in the language	
RR-0082	2.2.5	Allow declaration of objects of private	types in visible package specification	
RR-0320	13.5	Generalize case statement for other	types, including REAL	
RR-0549	4.4	Ensure the use of unconstrained actual	types is always legal	
RR-0012	13.3	Mutation of	types is needed for AI applications	
RR-0001	4.2	Limited	types need assignment, constants	
RR-0418	2.2	Representation clauses for array	types need to be added	
RR-0733	13.5	Need fixed-point	types not centered on zero	
RR-0412	12.3.9	Allow overloaded = for all	types, not just limited types	
RR-0649	2.2.2	Allow default initialization for all	types (not just records)	
RR-0110	6.4	placement of and access to data in different	types or regions of memory	/control over
RR-0098	13.4	Generalize incomplete typing for	types other than access or private	
RR-0295	4.6	Create TEXT_IO.PUT_LINE for	types other than string (make like PUT)	
RR-0197	13.6	designated object cannot be/	types, parameter mode IN should mean the	
RR-0287	2.4	For access	types point directly to designated object	
RR-0684	4.3	Make access	type's representation	
RR-0560	4.3	Related packages need access to a private	type's representation in related packages	
RR-0578	2.2.3	Need to access a private	types should be allowed	
RR-0007	2.4	Out-mode parameters of limited private	types should be specified	
RR-0202	4.2	Default representation for enumeration	types that have an assignment operation	
RR-0069	4.3	Relax parameter mode rules for limited	types to be added to a package without	
RR-0690	12.4.2	modifying the original/	types to be completed by subtype declaration	
RR-0668	4.3	Allow incomplete and private	types to get, for example, an array of packages	
RR-0019	4.2	Need package	types to specify finalization procedures for	
RR-0497	13.7	safely controlling use of collections	types used as generic actual can yield a/	
RR-0611	4.1	Allow	types, variables, constants, parameters, etc	
RR-0599	4.3	Presence of default discriminants for	types will help inheritance	
RR-0712	4.4	Allow subprogram	types within a generic unit	
RR-0098	13.4	Certain changes to derived/private	typing for types other than access or private	
RR-0103A	2.2.3	Need ability to declare double precision numeric	unchecked conversion for IN OUT and OUT parameters	
RR-0449	13.1	Generalize incomplete	unchecked conversion of private types	
RR-0353	2.4	Allow	Unchecked conversion should eliminate	
RR-0554	9.1	Do not allow	Unchecked_Conversion and I/O input	
RR-0549	4.4	Need constraint checks for target of	unconstrained actual types is always legal	
RR-0446	4.4	Ensure the use of	unconstrained generic types	Tighten the
RR-0006	4.4	contract model by distinguishing constrained/	unconstrained/constrained generic formal types	
RR-0472	4.4	Distinguish	unconstrained/constrained generic formal types	
AI-00873	2.3	Distinguish	undefined scalar values	
RR-0126	13.4	Type conversion/qualification of	underscore before "E" in exponents	
RR-0400	2.3	Allow	unhandled exception	
RR-0407B	2.3	Do not allow a task to die silently on an	unhandled exception	
RR-0581	12.2.1	Do not allow a task to die silently on an	unhelpful	Rules specifying the position
RR-0041	4.3	of pragma ELABORATE are error-prone and	unit	Allow overloaded subunits
RR-0190	4.4	with respect to a common ancestor library	unit	
RR-0511	4.4	Allow use of a base type within a generic	unit	
RR-0514	7.3	Allow use of a base type within a generic	unit	
RR-0548	13.4	for simple parallel threads within a program	unit	Provide support
		syntax for instantiating a nested generic	unit	Allow convenient

RR-0581C	13.4	given in the context clause of a parent library	unit	/for a subunit to mention a package name
RR-0712	4.4	double precision numeric types within a generic	unit	Need ability to declare
RR-0757	2.1	Clean up definitions of program unit and compilation	unit	
RR-0769	2.1	Correct wording in the definition of ancestor	unit	
RR-0757	2.1	Clean up definitions of program	unit and compilation unit	
RR-0483	12.3.7	/to have the same identifier as the generic	unit (as is allowed for package instances)	
RR-0218	12.2.1	Make the implementation find a good library-	unit elaboration order	
RR-0396	12.2.1	for pragma ELABORATE Add library	unit elaboration ordering rules to reduce need	
RR-0154	13.1	not have to be at the outermost compilation	unit level	Subunits should
RR-0545	13.1	not have to be at the outermost compilation	unit level	Subunits should
RR-0586	4.4	Different instantiations of the same generic	unit may have to evaluate their actual/	
RR-0205	12.3.13	Allow program	unit name on PRIVATE, BEGIN, and EXCEPTION	
RR-0407A	4.5	Need exception name, line number, and	unit name where raised	
RR-0065	4.3	pragmas to be separated from the compilation	unit to which they apply	/clauses and various
RR-0774C	4.3	Extend control of library	unit visibility	
AI-00850	2.3	Rejecting a	unit when a pragma's assumptions are not met	
RR-0017	6.2	to treat an Ada object as an array of storage	units	Be able
RR-0033B	4.4	Need to pass exceptions to subprograms and generic	units	
RR-0383	4.4	Need generic exceptions for truly reusable generic	units	
RR-0457	4.3	units as groups, control visibility of library	units	Structure library
RR-0496	2.1	Clarify termination of tasks whose masters are library	units	
RR-0698	4.3	portable and non-portable code into separate	units	Need ability to separate
RR-0101B	4.4	Need to pass exceptions as parameters to generic	units and subprograms	
RR-0526B	4.4	Need to pass exceptions as parameters to generic	units and subprograms	
RR-0457	4.3	Structure library	units as groups, control visibility of library units	
RR-0517	9.3	Provide syntax to declare program	units free from side-effects	
AI-00214	2.2.7	Allow accept statements in program	units nested in tasks	
RR-0095	13.4	Allow applicable	units to be named in USE clauses and pragma ELABORA/	
RR-0607	13.1	Allow names of compilation	units to be overloadable, operator symbols	
RR-0035	13.5.4	Allow generic	units to be overloaded	
RR-0370A	8.2	Can't recover space declared in library	units when reconfiguring a system	
RR-0519	13.1	Simplify overload rules for ambiguous/	universal expressions	
RR-0591	2.2.8	Allow fixed-point multiply/divide with	universal real operands	
RR-0689	12.2.4	Optional bodies should not be	unlinked without a warning	
RR-0005	4.4	in generic packages make code sharing	unnecessarily difficult	Exception declarations
RR-0259	13.7	Incomplete type declarations are dangerous and	unnecessary	
RR-0368A	4.3	Ensure	unnecessary recompilation is avoided	
RR-0688	4.3	redeclaring a subprogram body	Unnecessary recompilation required when	
RR-0280	5.1	Short delays are too inefficient; Calendar time	unnecessary; timing performance must be/	
RR-0284	13.1.1	Machine-code insertions are	unreadable; replace with INLINE macros	
RR-0390	3.1	Need 8-bit	unsigned CHARACTER for Greek and graphics symbols	
RR-0187	2.4	Need to allow	unsigned enumeration representation specifications	
RR-0332	6.1	Provide	unsigned integer capability	
RR-0433	6.1	There is a need for predefined	unsigned integer types	
RR-0460	6.1	Ada needs to provide support for	unsigned integer types	
RR-0138	6.1	Need full-sized	unsigned integers	
RR-0188	6.1	operations on/ Embedded applications need	unsigned integers and bit-wise logical	
AI-00600	6.1	Why we need	unsigned integers in Ada	
RR-0044	13.2	There is no need to add	unsigned integers to Ada	
RR-0721	6.1	Try to add	unsigned integers to the language	
RR-0692	2.3	Allow implementation-defined pragmas to cause	unsuccessful compilation if restrictions/	
RR-0565	2.2	clauses inappropriate 'SMALL is	unsuitably defined; need for representation	
RR-0615	2.2.12	Define LOOP/	UNTIL control structure as in Pascal	
RR-0515	4.2	Need ability to request indivisible	update for specific objects, especially in/	
RR-0544	4.2	Need indivisible	update on reference counts	
RR-0502	2.1	The Standard should be consistent in its use of	upper and lower cases	
AI-00216	10.2	/methods for testing whether characters are numeric,	upper case, lower case, control, etc./	
RR-0643	4.2	Garbage collection can now be done well; encourage its	use	
RR-0326	13.2		Use a different syntax production style	
RR-0300	13.2		Use an LR grammar to define the syntax of the language	
RR-0043	13.1.1	Make it easier and more portable to	use assembler with Ada	
RR-0588	13.4	Provide a form of	USE clause that hides outer homographs	
RR-0555	12.2.3	subprograms of a type Need "selective"	USE clause to get just operators and	
AI-00274	13.1	Proposed extension of the	USE clause — record component visibility	
RR-0095	13.4	Allow applicable units to be named in	USE clauses and pragma ELABORATE	
RR-0100	13.4	Allow constants to	use default values to get value	
RR-0629	4.1	Need procedure and function types for	use in subprogram calls	
RR-0034	3.1	Ada should	use ISO 8859/1-9 (8-bit) character set	

AI-00510	3.1			Use ISO symbols and standards in the Ada ISO Standard
RR-0622	2.1		The Standard should	use "metatype" in describing generic formal types
RR-0190	4.4		Allow	use of a base type within a generic unit
RR-0511	4.4		Allow	use of a base type within a generic unit
RR-0291	6.4		Clarify whether	use of an address clause causes storage to be initialized
AI-00539	2.2.4	representation classes	Allow	use of array/record attributes in
RR-0019	4.2	finalization procedures for safely controlling		use of collections
RR-0642	13.4	Add label variables to support		Allow types to specify
AI-00404	2.2	formal part		Use of incomplete private types in generic
RR-0252A	11.1	for IEEE floating point standard; allow full		use of machine characteristics
RR-0438	3.1		Allow	use of multi-octet character set
RR-0571A	12.2.5	when index bounds are determined by/	Allow	use of OTHERS choice with named associations
RR-0029	12.2.5	index constraint is determined by/	Allow	use of OTHERS with named associations when the
RR-0767	12.2.1	elaboration order problem without requiring the		use of pragma ELABORATE
RR-0576	13.4	Allow parameter default expressions to make		use of previous IN parameters
RR-0557	4.3	subprogram bodies helps get around the/	The	use of renaming declarations to provide
RR-0478	13.1	Add language facilities for restricting		use of resources to trusted packages
RR-0521	5.2	Need more convenient support for		use of shared memory among tasks
RR-0549	4.4		Ensure the	use of unconstrained actual types is always legal
RR-0502	2.1		The Standard should be consistent in its	use of upper and lower cases
RR-0731	11.1	as a basis for Ada's floating point model		Use the Language Compatible Arithmetic Standard
RR-0487	2.2.11	Need private task entries for exclusive		use within the task
RR-0531	4.3	Variants of a type can't be		usefully supported with current variant record approach
RR-0121	5.2		Provide more	user control over scheduling decisions
RR-0737	5.2	a select statement	Allow reliable	user control over selection of alternatives in
RR-0444	13.4	can be raised	Let the	user limit the places where a given exception
RR-0286B	5.2	also used by the run-time/	Embedded system	user may need access to interrupts that are
RR-0216	5.1	over timing	Need	user specified accuracy and precision control
RR-0112	4.2		Provide	user support for controlled space reclamation
RR-0541	4.2	support memory management	Allow	user-defined :=, =, DESTROY operations to
RR-0088	4.2		Problems associated with	user-defined assignment
RR-0070	4.2		Allow	user-defined assignment for limited types
RR-0160	4.2		Allow	user-defined assignment for limited types
RR-0184	4.2	private type	Need	user-defined assignment operator for limited
RR-0674	13.4.1		Allow	user-defined attributes as functions
RR-0509	13.4.1	private types	Allow	user-defined attributes for user-defined or
RR-0406	13.4.1		Allow	user-defined attributes for user-defined types
RR-0613	13.4.1	problems with implementation-defined/		User-defined attributes solve portability
RR-0466	4.2	to ensure release of resources	Allow	user-defined finalization for objects of a type
RR-0523	4.2	to ensure release of resources	Allow	user-defined finalization for objects of a type
RR-0509	13.4.1		Allow user-defined attributes for	user-defined or private types
RR-0682	13.5.1	"::", etc	Allow	user-defined overloaded operators such as "?",
RR-0609	4.2		Allow	user-defined override of =, /=, := on all types
RR-0475	4.2		Need automatically-invoked	user-defined routines to reclaim storage
RR-0715	2.2	for numeric types	Allow	user-defined type conversions and attributes
RR-0406	13.4.1		Allow user-defined attributes for	user-defined types
RR-0479	13.1		Need standard subprograms to get	user-interface information from OS
RR-0337	5.2		Provide some form of	user-modifiable priorities
RR-0116	5.2	change and graceful degradation		User-modifiable priorities needed for mode
RR-0426A	12.2.4	The effect of an optional package body is confusing to		users
RR-0286A	5.2		Embedded system	users need the ability to control timer utilities
RR-0120	4.2	when space is exhausted	Allow	users to defer the signalling of STORAGE_ERROR
RR-0248	13.1	that are outside record values	Allow	users to specify locations for discriminants
RR-0016	5.2		Allow	user-selectable task scheduling algorithms
RR-0092	4.2		Allow	user-specified finalization
RR-0118	4.2	STORAGE_ERROR recovery	Provide a	user-specified storage reserve for
RR-0413	4.2		Allow	user-written := for all types
RR-0669	4.2		Allow	user-written := routines
RR-0476	13.6	same name as the target type	Allow	user-written type-conversion functions with the
RR-0328	9.3	Require compilers to report questionable		uses of the language
RR-0329	13.1			Using a deferred constant before it has a value
RR-0647	4.1	to select actions depending on state without		using case statements
RR-0037	5.2	Allow tasks (i.e., delays) to execute		using simulated time rather than a real-time clock
RR-0084	5.2	Specify standard conventions for		using tasks that permit high-performance/
RR-0286A	5.2	Embedded system users need the ability to control timer		utilities
RR-0059	2.2.14	for returning a representation's underlying		value
RR-0097	13.4	Allow/require explicit action to get default parameter		value
RR-0100	13.4	Allow constants to use default values to get		value

RR-0272	13.6	Limited types are of little true	value
RR-0329	13.1	Using a deferred constant before it has a	value
RR-0453	11.1	or attribute yielding the sign of a numeric	value
RR-0567	2.2	declaration to get constraints from initial	value
RR-0234	12.1.2	"Sub-null" ranges are of little	value and an implementation burden
RR-0363	12.3.1	as discrete types	Allow 'VALUE and 'IMAGE to apply to real types as well
RR-0079	13.6	TERMINATE alternative adds little	value and is rarely used
RR-0465	2.2.14	to get the representation from an enumeration	value and vice versa
RR-0664	12.3.1	Need 'IMAGE and '	Need a way
RR-0614	12.3.4	condition RETURN to make selection of returned	VALUE attributes for floating-point types
RR-0031	13.5.3	Provide a way to test for a	value clearer
RR-0341	2.2	Allow discriminant	Allow WHEN
RR-0653	8.2	Need to declare constants whose	value in a non-contiguous set
RR-0621C	13.4	Allow case statements to dispatch on	value in record aggregate to be non-static
RR-0229	13.4	/hide the range of a scalar type and the initial	value is supplied after linking
RR-0255	11.1	Provide a function for returning the	value of an exception
AI-00873	2.3	Type conversion/qualification of undefined scalar	value of an object to ensure these values are/
RR-0040	2.2.14	to determine the internal coding of enumeration	value of the next floating point number
RR-0169	13.4	for actual or default generic formal subprogram	values
RR-0220	2.2.14	the internal code associated with enumeration	values
RR-0248	13.1	for discriminants that are outside record	Need a way
RR-0338	6.4	conversion between ADDRESS values and access	Allow "null" procedures
RR-0350	2.1	Clarify wording dealing with default initial	Need way to get
RR-0422	4.1	Allow subprograms as parameters and maybe also as	Allow users to specify locations
RR-0338	6.4	objects and safe conversion between ADDRESS	/pointers to static objects and safe
RR-0229	13.4	/the initial value of an object to ensure these	values
AI-00874	6.4	Ensure that access	values
AI-00420	3.1	Allow 256	values and access values
RR-0749	12.3.11	for slices serving as actual parameters and as	/pointers to static
AI-00874	6.4	Ensure that access values are	values are not used directly by programmers
RR-0302	2.4	The language should define literals for	values are values of 'ADDRESS
RR-0258	6.4	Need access	values for type CHARACTER
RR-0238	6.4	Allow access	values in record components
RR-0100	13.4	Allow constants to use default	/index sliding
RR-0293	6.4	Allow access	values of 'ADDRESS
RR-0123	7.2	Provide initialization	values of type ADDRESS
RR-0567	2.2	initial value	values that point to declared objects
RR-0032	12.2.2	Allow grouping of	values to designate read-only memory
RR-0054	13.2	Do not add	values to get value
RR-0773	6.2	Need to pack	values to point to declared objects
RR-0163	10.4	equality and assignment/	values to tasks at startup
RR-0563	4.1	Need to allow subprogram types and	variable declaration to get constraints from
RR-0247	13.6	Don't initialize access	variable declarations and related subprograms
RR-0611	4.1	Allow subprogram types,	variable length strings to the language
RR-0130	4.6	Replace DEFAULT_xy	variable-length records into a block for data transmission
RR-0642	13.4	Add label	variable-length strings with appropriate
RR-0271	13.6	Distinguish storage classes for	variables
RR-0018	6.4	Need pre-elaborated constant arrays with	variables by default to NULL
AI-00345	4.6	Record type with	variables, constants, parameters, etc
RR-0568	2.2	Allow non-nested	variables in Chapter 14 by functions
RR-0531	4.3	a type can't be usefully supported with current	variables to support use of finite state machines
RR-0593	4.6	Mandate implementation of	variables with key words like CONTROLLED or STATIC
RR-0707	2.2.6	Need same-name component identifiers in different	variable-sized elements
RR-0531	4.3	with current variant record approach	variant having no discriminants
RR-0532	2.2.6	Allow same-type record components in different	variant parts in record types
RR-0327	10.4	Add	variant record approach
RR-0419	10.4	Add some form of support for	variant record I/O in DIRECT_IO/SEQUENTIAL_IO
RR-0640	6.1	Need to access chunk of a bit	variants
RR-0741	7.3	Need hot performance on	Variants of a type can't be usefully supported
RR-0738	7.3	Add facilities to support	variants to share name
RR-0741	7.3	Need hot performance on vector machines; add	varying length strings to the language
RR-0626	6.2	the same target machine e.g., because of dope	varying length strings to the language
RR-0368B	4.3	tools other than those provided by the compiler	vector as a whole
RR-0759	13.3	Add real-time and	vector machines; add vector types and operands
RR-0289	6.2	discriminant is present	vector processing hardware
AI-00274	13.1	of the USE clause — record component	vector types and operands
RR-0774C	4.3	Extend control of library unit	vectors
RR-0624	12.2.3	Provide selective direct	/not portable among compilers, even for
			vendor
			/the library can be manipulated by
			verification facilities for control engineering
			views of a record structure even when no
			visibility
			Proposed extension
			visibility
			visibility into a package

RR-0182	8.1	running on different processors	Define	visibility limits for parts of a program
RR-0393	12.2.3	by renaming	Can't get direct	visibility of fixed point mult and div operator
RR-0457	4.3	Structure library units as groups, control		visibility of library units
RR-0073	4.3	program library	Allow	visibility of names to be restricted within a
RR-0022	12.2.3		Need direct	visibility of operators declared in another package
RR-0232	12.2.3		Need to allow direct	visibility of operators in packages
RR-0727	12.2.3		Need selective direct	visibility of package declarations
RR-0131	13.4	In a qualified expression, should have		visibility of the enumeration literals of the/
RR-0274	2.1	The		visibility rules could be explained more clearly
RR-0057	12.2.3		Need direct	visibility to infix operators in another package
RR-0474	12.2.3	operators of a type	Need direct	visibility to just enumeration literals and
RR-0694	12.2.3		Need easy direct	visibility to the equality operations
RR-0239A	12.2.3	Renaming an enumeration type should make literals	visible	visible
RR-0429	12.2.3	makes just overloadable declarations directly	visible	Need construct that
RR-0652	12.2.3	should make the equality operator directly	visible	Declaring a subtype
AI-00378	12.2.3	Enumeration literals should be made directly	visible by a subtype declaration	
AI-00390	12.2.3	Character literals should be made directly	visible by a subtype declaration	
AI-00480	12.2.3	Operators should be made directly	visible by a subtype declaration	
RR-0082	2.2.5	Allow declaration of objects of private types in	visible package specification	
RR-0090	2.2.11	Allow some task entries to be	visible, some not	
RR-0678	7.1	for data shared between programs; need	VOLATILE	Pragma SHARED is not sufficient
RR-0434	7.1	Need atomic read/write operations on shared	volatile memory	
RR-0415	5.2	entry-queues, and prioritized selective	wait	Allow priority inheritance, prioritized
RR-0612	13.3	delay and terminate alternatives in selective	wait	Should allow both
RR-0697	5.2	Allow entry call alternative in selective	wait	
RR-0083	5.3	transfer of control via entry call/selective	wait construct	Provide asynchronous
RR-0498	5.2	statements and entry calls	wait symmetrical with respect to accept	
RR-0208	13.4	DIRECT_IO, and SEQ_IO operations without	waiting for completion	/to initiate TEXT_IO,
RR-0108	5.1	Need to be able to	wake up a task at a particular local time	
RR-0689	12.2.4	Optional bodies should not be unlinked without a	warning	
RR-0261	2.3	Need compile-time	warnings for access before elaboration errors	
RR-0242	2.3	Require compilation	warnings for potential run-time errors	
RR-0754	2.3	Require	warnings for unrecognized pragmas	
RR-0756	2.3	Require	warnings when pragmas are ignored	
RR-0458	4.4	Need convenient way to escape into	weakly typed subprogram call	
RR-0747	13.6	Provide better support for "light-"	weight parallelism (as in Linda)	
RR-0765	13.1	Allow	"when Package_Name.others =>" as exception handler	
RR-0236	2.4	/dependent behavior, or at least, ensure it is documented	whenever possible	
AI-00216	10.2	Provide standard methods for testing	whether characters are numeric, upper case, lower/	
RR-0252B	11.1	Programmer needs to know/control	whether rounding or truncation is used in real calculations	
RR-0291	6.4	to be initialized	whether use of an address clause causes storage	
RR-0063	5.3	Clarify	while performing critical functions	
RR-0180	4.1	Protect tasks from being aborted	Windows, etc	
RR-0774I	13.1	There is a need for procedures as parameters for X-	Windows, SQL	
RR-0689	12.2.4	Create separate standards, such as X-	without a warning	
RR-0069	4.3	Optional bodies should not be unlinked	without modifying the original package	
RR-0767	12.2.1	Allow subprograms and types to be added to a package	without requiring the use of pragma ELABORATE	
RR-0647	4.1	Solve the elaboration order problem	without using case statements	
RR-0208	13.4	Need ability to select actions depending on state	without waiting for completion	
AI-00291	4.4	/to initiate TEXT_IO, DIRECT_IO, and SEQ_IO operations	works for all floating point types	
RR-0633	6.1	Can't define a generic package that	XOR) for integers	
RR-0497	13.7	Provide logical operations (e.g.,	yield a surprising run-time error	
RR-0453	11.1	/for types used as generic actual can	yielding the sign of a numeric value	
RR-0366	13.6	Provide a special function or attribute	zero	
RR-0733	13.5	Subtype natural should not include	zero	
RR-0637	11.1	Need fixed-point types not centered on	zero did not exist	
AI-00442	13.4	Ada programs should run as though negative	zone information in package CALENDAR	
		Time		